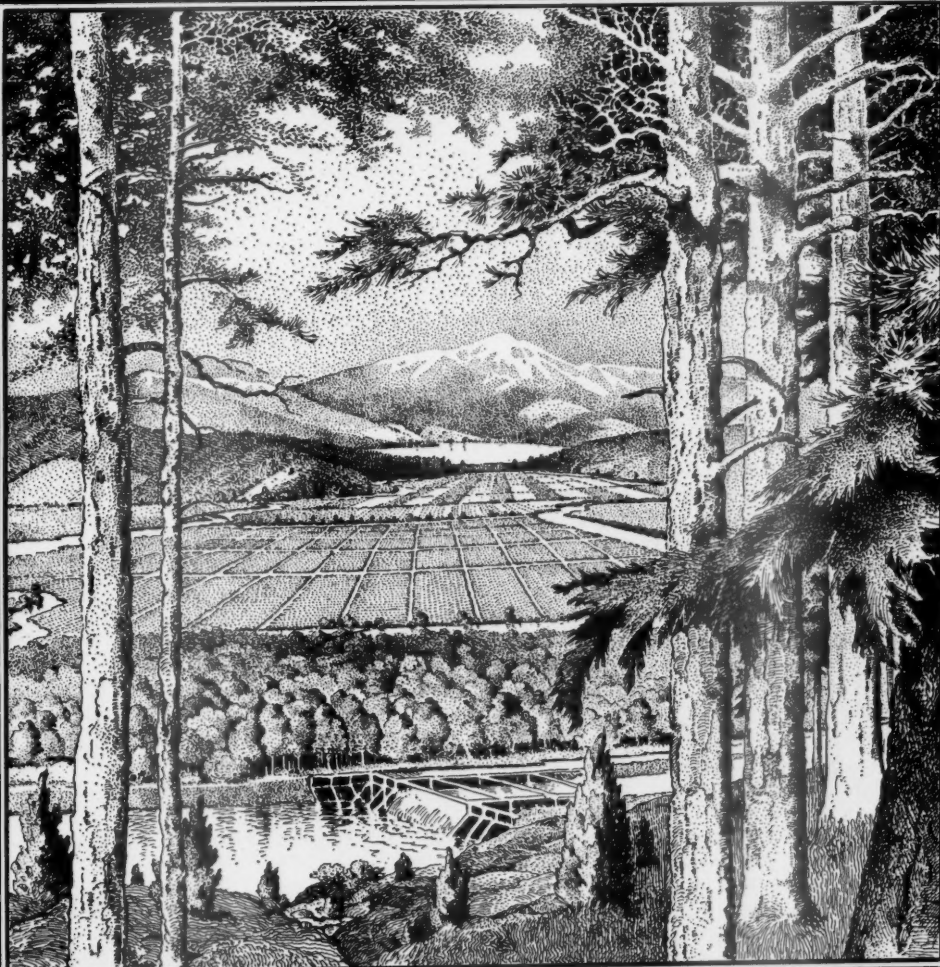


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AUGUST, 1902

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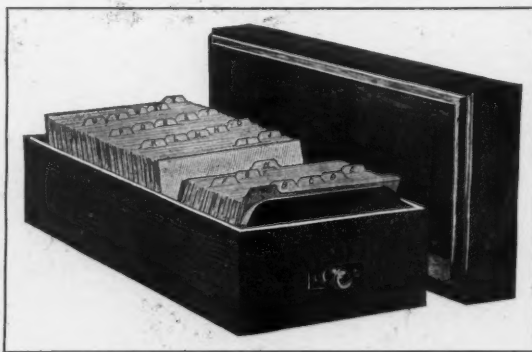
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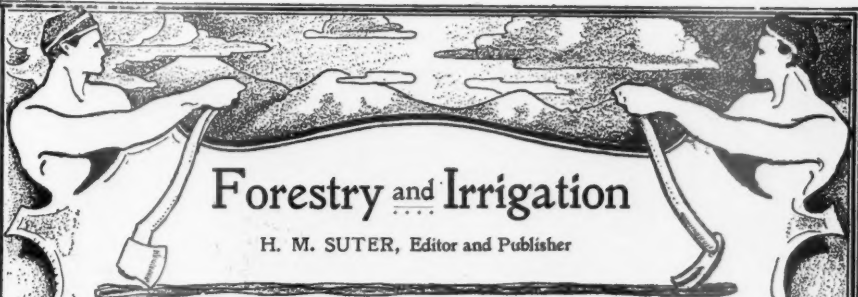
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The objects of the Association, as set forth in its Constitution, are as follows:

1. The adoption by the Federal Government of a permanent policy for the reclamation and settlement of the public domain, under which all the remaining public lands shall be held and administered as a trust for the benefit of the whole people of the United States, and no grants of the title to any of the public lands shall ever hereafter be made to any but actual settlers and homebuilders on the land.
2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.
3. The construction by the Federal Government of storage reservoirs and irrigation works wherever necessary to furnish water for the reclamation and settlement of the arid public lands.
4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.
5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.
6. The holding of an annual Irrigation Congress, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the encouragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.



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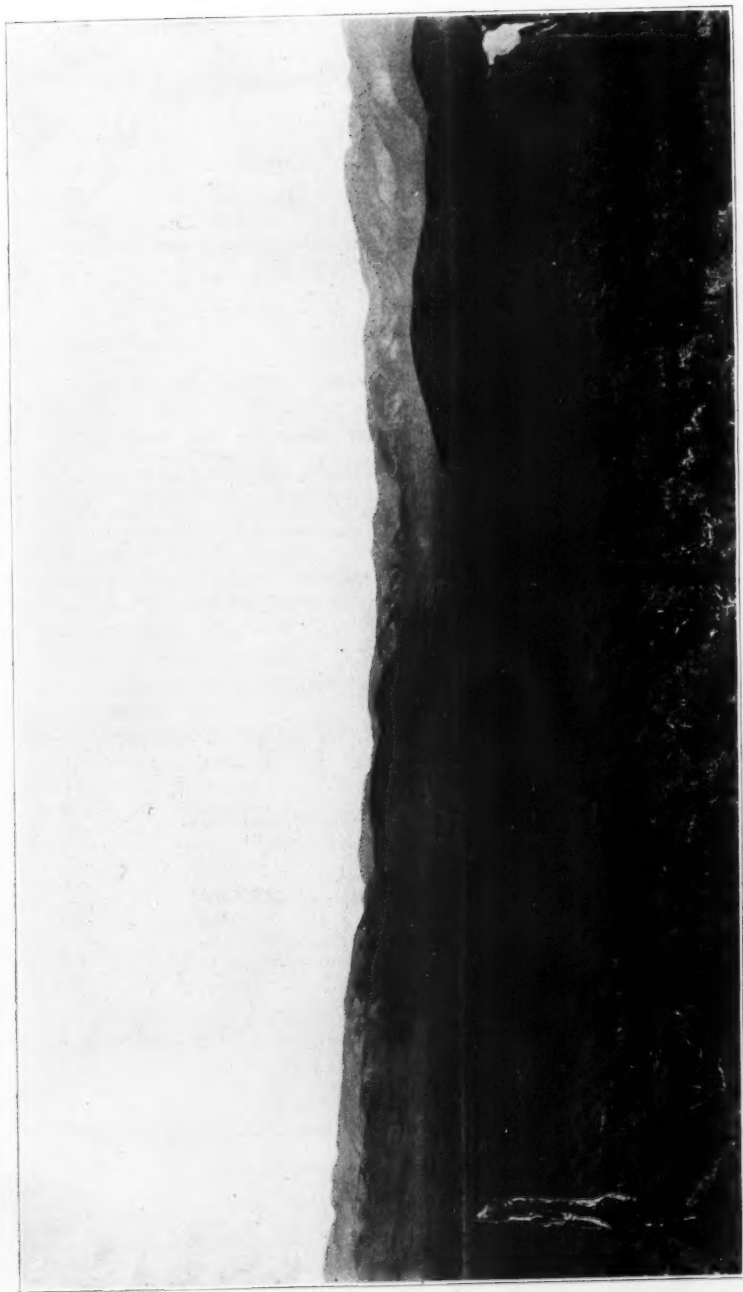
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VIEW SHOWING LANDS IN NEVADA WITHDRAWN FROM ENTRY IN CONNECTION WITH PROPOSED NATIONAL IRRIGATION WORKS (P. 317).

Forestry and Irrigation.

VOL. VIII.

AUGUST, 1902.

No. 8.

NEWS AND NOTES.

Program of the Michigan Meeting.

The program of the special summer meeting of the American Forestry Association, to be held at Lansing, Mich., August 27 and 28, has been arranged with special reference to Michigan conditions. Among the papers to be read are the following:

"The Water Resources of Michigan" (with an account of the work of stream measurements being made in Michigan by the U. S. Geological Survey), F. H. Newell; "Meteorological Conditions," Prof. J. A. Henry, U. S. Weather Bureau; "The Trespass Problem and How to Solve It," Ernest A. Bruncken, Secretary of the late Wisconsin Forest Commission; "A Discussion of the Jack Pine Plains," Filibert Roth, General Land Office; "The Shifting Sand Question," Dr. John C. Gifford, New York State College of Forestry; "The Farm Woodlot," F. G. Miller, Bureau of Forestry; "The Fire Problem and How to Solve It," H. B. Ayers, Carlton, Minn.; "The Michigan Forest Preserve," Thomas H. Sherrard, Bureau of Forestry; "The Minnesota Forest Fire Law," Gen. C. C. Andrews, Chief Fire Warden of Minnesota; "Some Cardinal Principles in Tree Planting for Silvicultural Purposes," Prof. J. W. Toumey, of Yale Forest School; "The Duty of the State in Forest Matters," Gifford Pinchot, Forester, U. S. Department of Agriculture; "Forest Botany Suggests What for the New Forests of Michigan?" Prof. C. A. Davis, University of Michigan; "Periodicity of Tree Growth," E. E. Bogue, Michigan Agricultural College; "The Management of Michigan Hardwood Forests, with a View to Future Yields," Walter C. Winchester, Lumberman,

Muskegon, Mich.; "The Chippewa Reservation in Minnesota," H. H. Chapman, Minnesota Experiment Farm; and the "Relation of Soils to Distribution of Forests in Middle Michigan," Burton E. Livingston. The speakers will be followed by Michigan members of the Association, who will lead in the discussion of the papers read, in order to bring out fully the application to Michigan conditions of facts and principles set forth in the various papers.

As stated in the July number of FORESTRY AND IRRIGATION, there will be three sessions on Wednesday, August 27, and two sessions on Thursday, August 28. Following the sessions at Lansing, there will be an excursion to the Michigan Forest Preserve in Roscommon and Crawford counties, and through the hardwood forests in Antrim county, thence to Mackinac Island.



Reduced Railroad Rates to Lansing.

The Michigan Passenger Association and Central Passenger Association have authorized a one and one-third fare for the round trip to Lansing, Mich., to all persons who desire to attend the special summer meeting of the American Forestry Association. It is expected that the remaining passenger associations will also authorize a one and one-third fare.

Members expecting to attend the meeting are earnestly requested to observe the following conditions: First, purchase a first-class ticket to Lansing, paying full fare, and request of the ticket agent a *printed certificate* of purchase, standard form; second, if through ticket to Lansing cannot be procured at starting point, purchase to nearest

point where through ticket can be obtained, requesting a certificate from the ticket agent at the point where each purchase is made; third, tickets for the return journey will be sold by the ticket agent at Lansing at one-third the first-class limited fare only to those holding certificates signed by the ticket agent at the place where ticket was purchased, countersigned by the Secretary of the Michigan Forestry Commission; fourth, the one and one-third fare will not be granted from local points on the Michigan Central Railroad and the Lake Shore and Michigan Southern Railway, on which the rate of fare is only two cents per mile; fifth, a representative of the Michigan Passenger Association will be present at the meeting August 28 and also on the return of the excursion to Lansing, September 1. This will give those who cannot attend the excursion an opportunity to have their certificates signed immediately after the close of the sessions at Lansing. A charge of twenty-five cents will be required of certificate-holders for each certificate signed, to cover the expenses of the special agent of the Michigan Passenger Association.

A Texas Irrigation Experiment. On another page of this number of FORESTRY AND IRRIGATION there is printed an account of a very interesting irrigation experiment by Mr. F. F. Collins, of San Antonio, Tex. In a recent letter to the editor, Mr. Collins has the following to say about his venture :

DEAR SIR : The principles of irrigation are, from my standpoint, so very simple, and the immense revenues from irrigated acres in southern sections are so well known, that I find myself wondering why every section in the south, where a sufficient supply of water can be easily obtained, is not being cultivated in this way.

And I might add that it is a source of surprise to me that the farmers of the north, whose knowledge of agriculture in all probability exceeds that of southern farmers, do not so arrange, where possible, to use irrigation during dry

spells. The big profit in farming is in sure crops, and with irrigation no time is lost looking for rain.

In this part of Texas we do not have our share of rain. The past two seasons were unusually dry ones. Those who used irrigation regarded those conditions with satisfaction, as higher prices were secured for what they raised. It must not be inferred, however, by this remark that no sympathy was extended to those who planted and reaped no harvest. The satisfaction felt was based solely upon the fact that they were in a position to take advantage of the demand at advanced prices.

I have preached and practiced irrigation for twenty years. My irrigated gardens were conceived by me for an object lesson, to prove what I had been preaching, not especially desiring to make the investment profitable. Hence you can imagine my surprise when at the end of the first year, commencing on a mesquite-covered tract of 140 acres, I netted from rentals over thirty per cent on my original investment. Those who cultivated the 10-acre tracts into which I divided the 140 acres netted from \$300 to \$625 per acre.

What I have done is possible on every acre in what we know as the artesian belt, in which San Antonio is the center. There are 31 artesian wells within the city limits, with a flowing capacity of 76,000,000 gallons per day, ranging in depth from 700 to 2,200 feet. My well is 600 feet deep and flows a 10-inch stream. South and east of my property, water in some instances has been reached in less than 600 feet. All our soil needs is water. Put the water on the land and farm intelligently and a good profit will result.

As the crops we raise on irrigated fields mature from four to six weeks earlier than in any other southern section that commands railroad facilities, we secure the highest market prices in the northern and western markets. Last season one small station between San Antonio and the Gulf shipped \$38,000 worth of cabbage, while Corpus Christi, 20 miles further south, claims to have shipped double that amount.

Mr. T. C. Nye, of Laredo, raised this season on seven acres of irrigated land 241,425 pounds of onions, which he sold to one firm in Kansas City at two cents per pound. Compare these statements, which are facts, with the net earnings of farms anywhere in the United States cultivated without irrigation, and then join me in wondering why more fields are not irrigated, both in this and other portions of the country.

Yours very truly,

F. F. COLLINS.

Dendro-Chemistry.

The articles on "Progress in Dendro-Chemistry," by Mr. Wm. H. Krug, which have been appearing in FORESTRY AND IRRIGATION, are to be continued from month to month. They will include a review of the most important articles on dendro-chemical subjects appearing in the leading chemical journals.

Mr. Krug, who is in charge of the recently established dendro-chemical laboratory, will gladly furnish further information on all subjects in connection with his work to readers who desire it. He may be addressed in care of the Bureau of Forestry.

Forest Planting and Reservoirs.

The Metropolitan Water Board of Massachusetts began forest planting this year, according to plans prepared by the Bureau of Forestry, on the watershed of their large reservoir situated near Clinton. This reservoir when completed will furnish the water supply for Boston and a number of other nearby cities and towns. The planting has been completed on 175 acres, and a large quantity of nursery stock is now on hand for the continuation of planting in the fall and next spring.

A planting plan is in course of preparation for the water department of the city of Woonsocket, R. I., for the protection of certain portions of the watershed of their large storage reservoir located six miles south of Woonsocket. Planting along the lines laid down in

this plan will begin the last of September, under the personal direction of an agent from the Bureau of Forestry.

The State of North Dakota has made application through Governor Frank White for planting plans for woodlots on the grounds of a number of state institutions, and these plans will be prepared during August and September of this season. An examination of the grounds of the following institutions has been requested: The state capitol at Bismarck, the School for the Deaf at Devil's Lake, the University of North Dakota at Grand Forks, the Normal School at Maysville, the Normal School at Valley City, and the Manual Training School at Ellendale.

Meeting of the Tennessee Forest Association.

The summer meeting of the Tennessee Forest Association was held at Monteagle, Tenn., on July 21. The opening address was made by Col. J. B. Killebrew, President of the Association. The program included the following papers:

"Forests as an Inspiration to Culture," Miss S. Gentry; "Our Inherited Disparagement of Forestry," Dr. F. W. Moore; "Relations Between Geology and Forests," Prof. P. H. Manning; "Need of Organization and Legislation on Forestry in the South," Dr. B. J. Ramage; "The Preservation of the Appalachian Forests in a National Park," Dr. R. H. Battle.

At the evening session Dr. C. A. Schenck delivered an illustrated lecture on the "Management and Utilization of German Forests."

The Executive Council announced that the annual meeting of the Association will be held at Knoxville in November.

Forest Reserve at Head of the Mississippi.

A matter of decided importance in the future welfare of the forests of Minnesota is a provision contained in the recent act passed by Congress, which amends the bill for the relief of the Chippewa Indians. This act, which provides a new way for the disposal of the timber and agricultural



Photo by Mr. Arthur B. Herrell.

WHITE PINE TIMBER ON THE CHIPPEWA RESERVATION FOUR MILES EAST OF THE VILLAGE OF CASS LAKE.

lands on the Indian reservations of northern Minnesota, creates a forest reserve of more than 200,000 acres. The bill authorizes the sale of the merchantable pine timber on the lands of the ceded Indian reservations that after survey may be classed as "pine lands." The lands to be reserved are to be selected from these pine lands as soon as practicable by the Forester of the Department of Agriculture, with the approval of the Secretary of the Interior, on the four following reservations: The Chippewas of the Mississippi, Leech Lake, Cass Lake, and Winnebigoishish.

It is provided that these lands selected by the Forester are to be known as "forestry lands," and on which the purchaser shall be required to leave standing 5 per cent of the pine timber for the purpose of reforestation. This is to be selected and reserved under such rules and regulations as may be prescribed by the Forester of the Department of Agriculture and approved by the Secretary of the Interior. The bill provides further that there shall be reserved from sale or settlement the timber and land on the islands in Cass Lake and in Leech Lake and not less

than 160 acres at the extremity of Sugar Point, on Leech Lake. The peninsula known as Pine Point, on which the new Leech Lake Agency is now located, is also to be reserved. The islands in Cass and Leech Lakes and the land reserved at Sugar Point and Pine Point Peninsula are to remain as Indian land, under the control of the Department of the Interior.

These "forestry lands," as rapidly as the authorized 95 per cent of the merchantable pine timber is removed, are to become a part of a forest reserve as though set aside by presidential proclamation. The remaining lands, after the Indian allotments, will be opened to homestead settlement. The accompanying illustrations show typical pine lands in the Chippewa district. They are reprinted here through the courtesy of Gen. C. C. Andrews, Chief Fire Warden of Minnesota.

The proceeds from the sale of the merchantable pine and the lands sold to

homesteaders are to be paid into the United States Treasury to the credit of the 1,600 Chippewa Indians of Minnesota. Each Indian—man, woman, or child—living on the four reservations is entitled to have an individual allotment of 80 acres. Of the 830,162 acres contained in these reservations, the following will be the result when the new law is carried out:

	Acres.
Water surface (lakes, rivers, streams).....	218,470
Indian allotments.....	140,000
Forestry lands.....	231,000
Islands in Cass and Leech Lakes and points around Leech Lake.....	17,000
Open to settlement.....	223,692
Total.....	830,162

Forest Fires. During the past month there have been many forest fires in various sections of the country. In California there were destructive forest fires near Redding,



Photo by Mr. Arthur B. Herrell.

VIEW IN THE CHIPPEWA RESERVATION NORTHWEST OF CASS LAKE. THREE OF THE CASS LAKE BAND OF CHIPPEWAS IN THE CENTER.

Cazadero, Grass Valley, Marysville, Monterey, and Tuolumne.

Wyoming has been visited by forest fires during the past two weeks, the worst being near Lander; also in a section of country west of the Medicine Bow Forest Reserve. On August 8 three destructive fires were reported from the vicinity of Battle Lake.

The fires reported last month from **Colorado**, in the vicinity of Durango, burned over an area of 25 square miles of territory. On Blanco Mountain 5,000 acres have been burned over. On August 2 a fierce forest fire was reported burning near Leadville; another serious fire burned over a large area in the region of Allen's Park.

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The lands withdrawn lie within the following described townships:

T. 59 N., R. 5 W.

T. 60 N., R. 4, 5, and 6 W.

T. 61 N., R. 5, 6, 7, 8, 9, 10, and 11 W.

T. 62 N., R. 5, 6, 7, 8, 9, and 10 W.

T. 63 N., R. 5, 6, 7, and 8 W.

All west of the fourth principal meridian.

General Andrews' letter to the Commissioner of the General Land Office was as follows:

ST. PAUL, MINN.,

May 10, 1902.

HON BINGER HERMANN,

Commissioner General Land Office,
Washington, D. C.

DEAR SIR: I have the honor hereby to recommend that the following townships, all public land, situated in Cook and Lake counties, in Minnesota, and comprising, after deducting water surface, an area in round numbers of 500,000 acres, be set apart by the President as a forest reserve, namely:

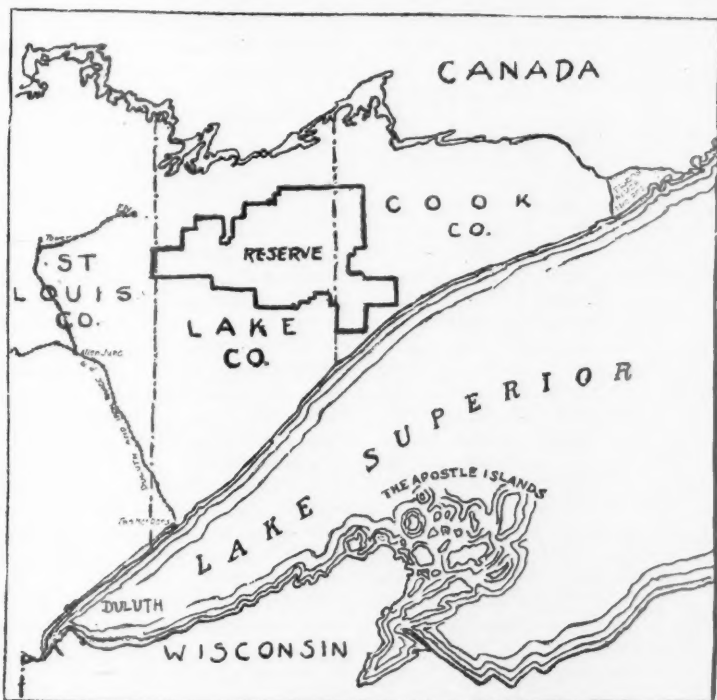
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T. 63, R. 5 to 7 W., both inclusive, and south half of T. 63, R. 8.



MAP OF NORTHEASTERN MINNESOTA, SHOWING LOCATION OF THE PROPOSED LAKE SUPERIOR FOREST RESERVE.

Ten of these townships are unsurveyed, and all of the lands are practically vacant, with these exceptions, that only half of T. 59, R. 9 W., and T. 60, R. 8 W., are vacant, and that two-thirds of T. 60, R. 9 W., and T. 61, R. 5 W., are vacant. I make this recommendation for the following reasons:

1. The land has a general elevation of about 1,200 feet above Lake Superior, is generally hilly and rocky, and more valuable for the production of timber than for agriculture. It is natural timber land, but much of the original timber was killed by fires many years ago. Its soil is only third or fourth rate, and the fact that, although fairly accessible, none of it has been taken by settlers is of itself evidence that it is undesirable for agricultural purposes.

The benefit that will accrue to Minnesota by having this waste and vacant

land utilized for forest purposes is quite evident. Every one knows that the supply of pine timber in Minnesota is fast diminishing. Already several kinds of lumber from the Pacific coast are competing here with our home products, and as our home supply decreases rates of transportation on lumber from the coast will be advanced. Increase of the price of lumber will tend to retard the development of agricultural lands, farmers being among the principal local consumers of lumber. On this land proposed to be created a forest reserve it will require about eighty years for pine timber to grow to merchantable size. The population of the United States in eighty years from now, according to the estimate of the most competent judges, based on our past history, will be 320,000,000. Every one can see that the demand for lumber will then be very much greater than at present.

Cazadero, Grass Valley, Marysville, Monterey, and Tuolumne.

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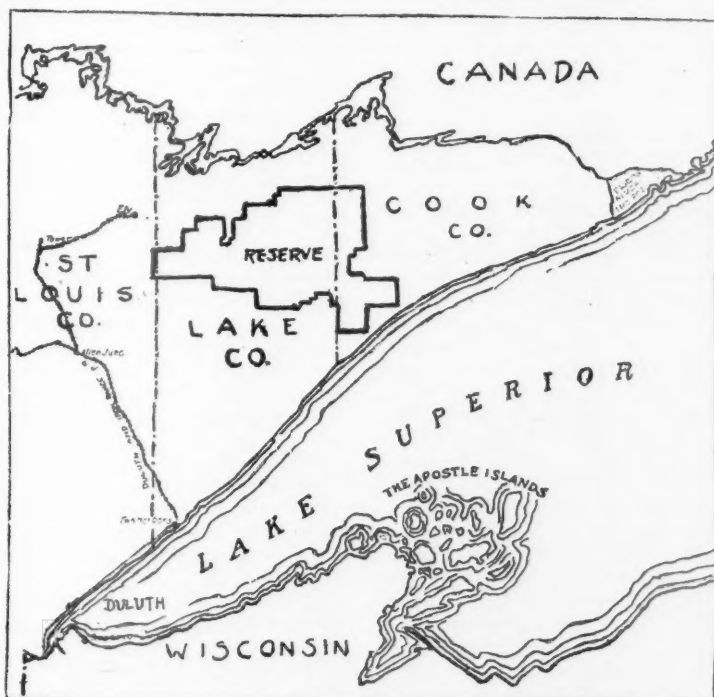
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3. The land in question contains many fine lakes and streams, and will, if administered as a forest reserve, prove valuable also as a fish and game preserve.

4. The educational effect of such a reserve would be useful in promoting forest economy in this state.

5. I have been reflecting upon this matter for over a year. I have also seen occasional expressions in the public press favoring a forest reserve, to include some of the highlands north of Lake Superior. I have examined the government plats of all the surveyed lands in Minnesota north of Lake Superior, and those herein contained are about the only lands that are available from being vacant. This is the only opportunity (outside of Indian reservations) of securing a number of townships in a body in this state for a forest reserve. Of course, it is understood that the state of Minnesota is entitled to sections 16 and 36 in each township as school lands; also that the state will have a right to any swamp lands there may be in either township; also, should any of the reserve be found to be good agricultural land, I, for one, would expect that the law would be made to permit, if it does not now permit, the use of such lands for agricultural purposes. I do not expect the reserve to

be a wilderness, nor to shut out any necessary means of communication.

Very truly yours,

C. C. ANDREWS,
Chief (Forest) Fire Warden.

The accompanying outline map of northeastern Minnesota shows the location of the proposed Lake Superior Forest Reserve.

National Irrigation Projects.

The Secretary of the Interior, after consultation with the officials of the Geological Survey, under whose active charge the national irrigation work is being conducted, has ordered additional lands in six states withdrawn from settlement, in accordance with the provisions of the irrigation bill, pending a careful survey of the proposed reservoir sites and canal routes. The lands withdrawn lie within the states of Colorado, Wyoming, Utah, Arizona, Nevada, and California.

It was considered important in advance of definite surveys to make withdrawals of a sufficient amount of land to include all of the proposed irrigation works and their ramifications, as well as the lands affected. Selections have been made in advance in a somewhat liberal manner, in order to allow the



VIEW ALONG THE LOWER COLORADO RIVER, SHOWING PUBLIC LANDS WITHDRAWN PENDING SURVEY OF RESERVOIR SITES.

consideration of alternative projects or to provide for unforeseen contingencies. In order to prevent speculative entries it was decided that these withdrawals should be made before it was announced that the work was to be taken up.

It was not intended in making withdrawal of these lands that all are to be irrigated or ultimately utilized. Survey parties now in the field will determine as soon as possible the lands needed, and the others will be restored to entry.

The projects now under consideration are as follows:

Nevada.—Truckee-Carson surveys.

California and Arizona.—Colorado River survey.

Arizona.—Salt River survey.

Colorado.—South Platte survey.

Colorado-Utah.—Grand River survey.

Wyoming.—Big Horn survey.

The lands to be segregated in each of the townships are included in the following townships and ranges:

TRUCKEE-CARSON SURVEY, NEVADA.

(Mt. Diablo Meridian.)

T. 18 to 21 N., inclusive, R. 16, 17, and 18 E.

T. 10 to 15 N., inclusive, and 19, 20, and 21 N., R. 19 E.

T. 9 to 24 N., inclusive, R. 20 E.

T. 7 to 17 N., inclusive, and 19 N., R. 21 E.

T. 13 to 17 N., inclusive, and 20 N., R. 22 E.

T. 16 to 18 N., inclusive, and 20 N., R. 23 E.

T. 16 to 18 N., inclusive, and 20 and 21 N., R. 24 E.

T. 16 to 21 N., inclusive, R. 25 E.

T. 16 to 20 N., incl., R. 26 and 27 E.

T. 16 to 25 N., inclusive, R. 28, 29, 30, and 31 E.

T. 20 to 24 N., incl., R. 32 and 33 E.

COLORADO RIVER SURVEY—CALIFORNIA AND ARIZONA.

(San Bernardino Meridian.)

T. 1 N., R. 24 E.

T. 1, 3, 4, and 5 N., R. 25 E.

T. 1, 2, and 3 N., T. 26 E.

T. 2 N., R. 27 E.

T. 1 to 16 S., inclusive, R. 22, 23, and 24 E.

T. 9 to 12 S., inclusive, R. 21 E.

(Gila and Salt River Meridian.)

T. 19 and 20 N., R. 22 W.

T. 4 to 10 S., inclusive, R. 21, 22, 23, 24, and 25 W.

All of Colorado River Indian Reservation which may be open to entry and settlement.

SALT RIVER SURVEY, ARIZONA.

(Gila and Salt River Meridian.)

T. 1, 2, 3, and 4 N., R. 1 and 2 W.

T. 1 to 7 N., inclusive, R. 1 E.

T. 1 S., R. 2, 3, and 4 E.

T. 1, 2, 3, and 4 N., R. 2 and 3 E.

T. 1, 2, and 3 N., R. 4 and 5 E.

T. 1 and 2 S., R. 5, 6, and 7 E.

T. 1 and 2 N., R. 6 and 7 E.

T. 3, 4, and 5 N., R. 7 E.

SOUTH PLATTE SURVEY, COLORADO.

(Sixth Principal Meridian.)

T. 4 N., R. 56 to 62 W., inclusive.

T. 5 N., R. 55 to 64 W., inclusive.

T. 6 N., R. 54 to 57 W., inclusive.

T. 7 N., R. 53 to 56 W., inclusive.

T. 8 N., R. 52 to 56 W., inclusive.

T. 9 N., R. 51 to 56 W., inclusive.

T. 10 N., R. 49 to 53 W., inclusive.

T. 11 N., R. 47 to 52 W., inclusive.

T. 12 N., R. 45 to 48 W., inclusive.

GRAND RIVER SURVEY, COLORADO—UTAH.

(Ute Meridian.)

T. 1 N., R. 1 and 2 E.

T. 1 S., R. 1 and 2 E.

T. 1 N., R. 1, 2, and 3 W.

T. 2 N., R. 1, 2, and 3 W.

T. 1 S., R. 1 W.

(Sixth Principal Meridian.)

T. 10 S., R. 98, 99, 100, 101, 103, and 104 W.

T. 9 S., R. 103 and 104 W.

IN UTAH.

(Salt Lake Meridian.)

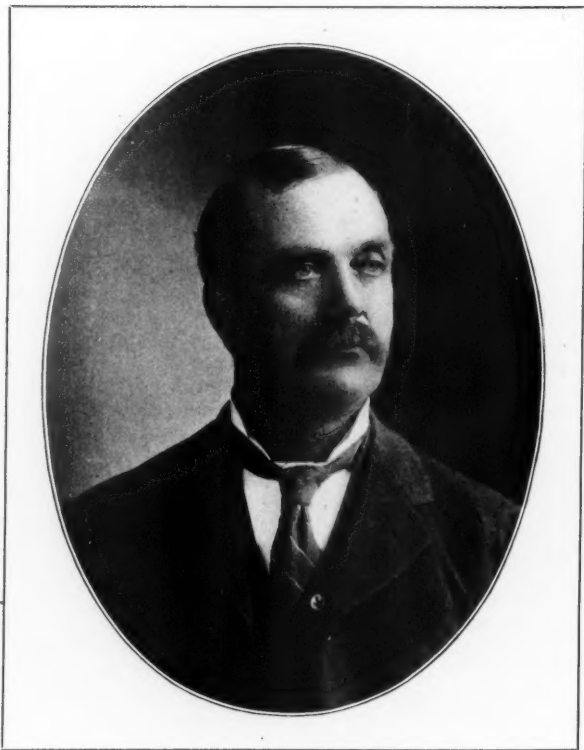
T. 19 and 20 S., R. 25 and 26 E.

T. 22 S., R. 24 E.

BIG HORN SURVEY, WYOMING.

(Sixth Principal Meridian.)

T. 51, 52, and 53 N., R. 80, 81, 82, 83, and 84 W.



HON. WILLIAM A. REEDER.

HON. WILLIAM A. REEDER, of Kansas, is one of the most effective friends of national irrigation. As a member of the House Committee on the Irrigation of Arid Lands, he has done much valuable work. Both in committee and among his fellow-members Mr. Reeder did splendid service in helping to bring about the passage of the Irrigation Bill at the recent session. Having a wide knowledge of the West and its needs, and himself a practical irrigator, he has been able to approach the question on its broadest and fairest lines. Thoroughly convinced of the advisability of Federal aid in the construction of large irrigation works in the West, Mr. Reeder has lost no opportunity of pressing the matter in Congress.

William Augustus Reeder was born August 28, 1849, in Cumberland county, Pa.; when 4 years of age his parents emigrated to Ipava, Fulton county, Ill., where, at the age of 14 years, he began teaching in the public schools. This vocation he followed until 30 years of age, the last 10 years of his work being in Kansas, where he was principal of the Beloit public schools. Mr. Reeder in 1871 took up a claim in Mitchell county, and has resided continuously since in this Congressional district. On August 18, 1876, he engaged in the banking business in the town of Logan, Kans., his present home. In 1890, in partnership with A. H. Ellis and J. J. Wiltout, he purchased an extensive tract of land on the Solomon River and established the largest irrigation farm in the State of Kansas, which is now operated as a cattle and hog ranch. In 1898 he was elected to the Fifty-sixth Congress, and was reelected to the Fifty-seventh Congress.

TREATMENT OF SECOND-GROWTH WHITE PINE.

PART I.

BY WALLACE I. HUTCHINSON.

THE following methods of thinning and pruning White Pine, and the effect of such cuttings, are based on investigation carried on in the natural pine groves of southern New Hampshire. Many of the principles set forth, although applicable to this portion of the country, will have to be slightly modified to suit conditions elsewhere.

As the supply of White Pine decreases and the stumpage value increases proportionately, the aim of nearly every farmer who owns a woodlot is likely to be the production of the greatest quantity of valuable timber in the shortest possible time. To do this, his first object should be to stock the area with a sufficient number of trees to form a complete cover overhead. This is not only beneficial to the soil, but also for the proper development of the trees. In the natural woods this state of affairs very often exists.

Natural forests are likely to be more valuable than artificial plantations, for

most natural forests grow only in such situations as are congenial to the life of trees, the seeds of which will not germinate readily in unfavorable soils. Nature seldom errs in the choice of conditions favorable to tree-growth, a judgment in which man is very liable to error.

Shortly after the leaf canopy is established the growing trees begin to crowd one another, and the struggle for light and space commences. A number of the trees overtop the rest, rearing their heads to the full enjoyment of the light. Below these a few trees here and there enjoy with their leading shoots the light which is not absorbed by the dominating trees. Others are left so far behind in the race that they are deprived of enjoyment of all direct light—that is, they are suppressed. They live for a shorter or longer period, but unless they are a shade-enduring species they are not apt to survive for any great length of time.

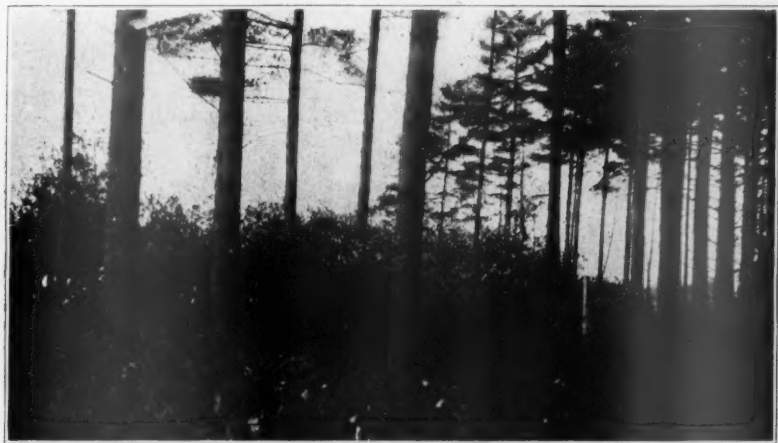


FIG. 1.—A WELL-MANAGED FOREST; LARGE TREES READY FOR MARKET; UNDERGROWTH SUFFICIENTLY DENSE TO PROTECT THE SOIL.

Thus the forest is divided into three classes—dominant, intermediate, and suppressed trees. This struggle for existence goes on during the entire life of the forest, and is apt to so reduce the growing space of each dominating tree that it cannot reach its fullest development, and on account of crowding is likely to assume a long, lanky shape, which is very easily damaged by wind and snow. It is this state of affairs that the owner should strive to obviate by thinning his trees. Thinning is the cutting out of such tree-growths as interfere with the healthy development, and hence the future value, of the crop. This form of thinning is termed the "weeding" out of the undesirable trees.

A single tree growing in the open and in the complete enjoyment of light will develop a full crown and root system and lay on a maximum volume of wood, but growth under these conditions has several serious drawbacks:

1st. Trees growing in this manner do not always produce the greatest volume of wood per acre. Although every tree in a crowded woods has a smaller volume than the isolated one, yet, owing to the greater number of trees, the crowded stand generally has a larger total volume per acre, and therefore greater stumpage value.

2d. Isolated trees usually grow short or crooked, while trees in thick woods are, as a rule, straight.

3d. Trees in the open generally have branches low down on the trunk; consequently they produce knotty and less valuable timber. Moreover, open stands are not apt to improve the fertility of poor soil on account of exposure to the light, which dries out the moisture; hence open stands can be grown best only in naturally fertile soils.

These few conditions govern profitable growth in all localities. Thus while in one case it would be proper to remove all suppressed and dominated, and even a part of the dominating, trees, in another case it would be necessary to look carefully after all of these classes in order to secure the maximum growth and the highest timber value from the land.

Certain important changes are gradually taking place in the growth of trees in the forest, both individually and collectively. There are changes in the soil in which they grow, in the surrounding atmosphere, and changes wrought even upon the inhabitants in the neighborhood. These changes are chemical and mechanical. A growing tree takes from the soil the elements that are essential to its development, but restores them to the soil through its fallen leaves and branches in the form of carbonaceous and nitrogenous matter. Thus, under normal conditions the soil grows richer and capable of supporting larger and more luxuriant forests. The mechanical changes are more easily traced. The roots of trees change the composition of soil by forcing their way into it, thus disintegrating the rocks and earth and allowing the free access of air and water.

In dividing the trees of a forest into classes an account must be taken of the dead trees. These should be removed at every thinning, as they can be of no benefit to the other classes, but may be a constant source of danger from insects, fungi, and, in many cases, fire.

All thinnings are carried on with one of two objects in view: first, the production of the greatest quantity of material; second, the production of the highest quality of timber. The means of attaining these ends differ considerably.

Experience has taught that the greatest quantity of timber is produced in the shortest time by the vigorous development of the dominating trees. These are removed and converted into lumber as soon as the undergrowth is of sufficient density to protect the soil (Fig. 1). The first thinning is made as soon as the struggle for existence commences—that is, when it is found that the trees are contending with each other for light and space. If the owner of the woodlot has gone over his land in the early stages of its tree growth and weeded out the undesirable trees, this first thinning may be delayed till the tenth or fifteenth year, when the trees taken out may be utilized for firewood or temporary fence posts. The thinning should be heavy enough to give the trees that remain the:



FIG. 2.—NATURAL REPRODUCTION OF WHITE PINE, SHOWING DENSITY OF GROWTH.



FIG. 3.—SHOWS EFFECT OF THINNING AND PRUNING; SAME STAND AS SHOWN IN FIG. 2.



FIG. 4.—NATURAL REPRODUCTION OF WHITE PINE. SEED TREES (IN THE BACKGROUND) ON THE WINDWARD SIDE.

space they require. As White Pine may naturally come up in a very thick stand, quite a slash will be necessary to rid the woods of the undesirable trees (Fig. 2, Fig. 3). In choosing the ones to be removed, the deformed and diseased trees should be taken first. The former, if

left, will never amount to anything, and are liable to injure the growth of the remaining crop. The latter usually harbor injurious forest insects, which in a great many cases cause considerable damage.

There can be no set rule as to what



FIG. 5.—SHOWING GRAY BIRCH AND YOUNG WHITE PINES.

space of time shall elapse between thinning. The quicker the growth, the shorter the interval between cuttings during the early life of the tree, the time being gradually lengthened as the trees advance in age. Common sense will have to govern largely on this point. The expense of thinning can be almost eliminated by the sale of the trees to be used in box-board manufacture, in southern New Hampshire White Pine for box boards being worth from \$6 to \$10 per thousand. Under no conditions should brush wood be left in the forest, as it greatly increases the danger from fire. If the work of thinning is carefully carried out, a stand of White Pine should be ready for the market in thirty or forty years, while by that time the ground will be in good condition for a seed-bed.

Cutting for reproduction should be carried on with considerable care and forethought. A few select trees, varying in number from ten to thirty per acre, may be left on the cut-over area to seed the ground, or a small lot may be cut clear and the ground allowed to seed itself from the surrounding trees. In the latter case the seed trees should

be left on the windward side, so that the seeds can readily blow into the open (Fig. 4), the cuttings to be made, if possible, when there are indications of a good seed year.

While the white-pine seedlings are still small, Gray Birch (*Betula populi-folia*) is almost sure to come in, and, as it grows much more rapidly than the pine, soon overtops the latter trees (Fig. 5). The birch should be allowed to remain only as long as it is of material aid to the seedling as a nurse. After the pines are old enough to take care of themselves the birch should be removed.

Even aged stands in a natural forest are rare, as the whole of a denuded area is seldom seeded at once. In a natural forest, therefore, cutting should begin by taking out the mature trees first, thus allowing those that remain to quicken their growth through the increased amount of light and space. In summing up it may be said that when the object is to produce quantity, thinning should be early, heavy, and often during the first half of the life of the woods, and more moderate and at longer intervals during the second half.

EXTENT OF IRRIGATION IN COLORADO.

AREA RECLAIMED ALMOST DOUBLED DURING LAST TEN YEARS.

DURING the decade 1889 to 1899 Colorado advanced to the front rank of irrigated states, surpassing California in the extent of land under irrigation, but remaining second in the number of irrigators and in the value of irrigated crops. The colder climate and greater altitude of Colorado make it impossible to raise the high-priced citrus or semi-tropical fruits, or to practice the degree of intensive farming for which Arizona and California are noted.

The land surface of Colorado comprises 66,332,800 acres, of which only 9,474,588, or 14.3 per cent, were included in farms in 1900, and 2,273,968 acres, or 3.4 per cent, were improved. Of this area, 2,240 acres are included

in the Indian reservations. Of the total area in farms, 24 per cent is improved.

The importance of irrigation as a feature of the agricultural development of the state is shown by the fact that the irrigated land outside of the Indian reservations amounts to 1,611,271 acres, or 70.9 per cent of the improved farm land. In 1890 the acres irrigated outside of the Indian reservations numbered 890,735, or 48.8 per cent of the improved land. Since then, by the opening of new ditches and canals, by the enlargement of those previously constructed, and by the application of more intelligent methods of water distribution, 720,536 acres of land have been added to the irrigated area of

the state, an increase of 80.9 per cent. In 1890 most of this land was public domain and comparatively valueless. At the present time its value, at a low estimate, is \$28,968,552, an average of \$40.77 per acre. Irrigation has added this large amount to the farm wealth of the state.

The total number of acres of irrigated crops is 1,300,840, while the total number of acres of land irrigated is 1,611,271. The difference of 310,431 acres represents in part the area of pasture lands irrigated, but includes also a considerable acreage, which, by reason of shortage of water, was only partially irrigated and did not produce crops. On the other hand, it is probable that a portion of the area upon which crops were reported as grown without irrigation was really irrigated at some time during the year.

While the number of farms outside of the Indian reservations increased in ten years 50.7 per cent, the number of irrigators increased 82.3 per cent, and the irrigated area 80.9 per cent.

Most of the water used for irrigation is surface water obtained from rivers, but, in addition to this, considerable quantities of ground water, or so-called underflow, found at depths varying from 20 to 1,500 feet, have been utilized. There were 227 farms which were irrigated wholly or in part by pumping this underflow from wells.

The number of acres of irrigated land for each mile of ditch operated averages 218. The number of acres under ditch for each mile is 390, or nearly twice the area irrigated. In other words, the area rendered cultivable by irrigation would be nearly doubled if the ditches already constructed were furnished with a sufficient and properly administered water supply.

In 1899, however, the water supply in many parts of Colorado was exceptionally deficient, and in years of average precipitation the area irrigated is undoubtedly much larger.

The average cost of constructing the ditches was about \$1,575 per mile. The average construction cost per acre of land under ditch was \$3.60, and per acre of land actually irrigated in 1899,

\$7.21. The average cost of maintenance per acre irrigated in 1899 was \$0.34; but estimating the cost of water right upon the basis of the area irrigated in a year of short water supply necessarily made the average cost higher than it would be in an ordinary year.

In 1899 the average value of arable land under ditch, but not yet prepared for irrigation, varied from \$2 to \$20 per acre, while that of irrigated land is from \$24 to \$1,000. The difference represents the increment to the value of the land by irrigation and the improvements thereby made possible. This shows a large profit on the cost of ditch construction.

There were in 1889 7,055 acres irrigated from wells. The total cost of construction of the irrigation systems obtaining water from wells was \$190,566. The value of all land in irrigated farms, not including buildings, is \$79,696,998, and in unirrigated farms, \$10,640,465. The value of all buildings on irrigated farms is \$13,178,702, and on unirrigated, \$2,822,700. The land in irrigated farms, then, represents 88.2 per cent of the total value of all farm lands, although constituting but 65.8 per cent of the total acreage. The value of buildings on these farms is 82.4 per cent of the total for all farms, and the value of implements and machinery 83.1 per cent. The irrigation systems in the state, as reported in 1899, represent a cost of \$11,613,732. The value of the irrigated products grown in 1899 was \$15,633,938. The irrigated area in crops is 1,300,840 acres. The income from this land in 1899 was therefore slightly more than \$12 per acre.

Exclusive of the Indian reservations, the average value of land, exclusive of buildings, is for all farms, \$9.54 per acre; for unirrigated farms, \$3.29, and for irrigated farms, \$12.77. The average value per acre of irrigated land is \$40.77, while that for the best irrigated land, suitable for growing alfalfa, ranges from \$50 to \$150, and irrigated fruit land has in some instances a reported value as high as \$1,000 per acre.

The principal rivers of the state are the South Platte, Arkansas, Rio Grande, San Juan, Grand, and Green. The three last



mentioned are tributaries of the Colorado of the West. The state has been divided by law into six large drainage divisions, corresponding with the natural hydrographic basins of the above-named six principal rivers. For administrative purposes, these divisions are subdivided into water districts.

The most important drainage basin in Colorado is that of the South Platte River. The headwaters of the South Platte are in South Park, in Park county. In the mountains the stream has a considerable fall, which gradually diminishes as it enters the plains. Like most streams in this region, it is subject to great fluctuations in volume. During the spring floods its channel is nearly a mile wide and the discharge is very great, while at other seasons it sinks into its sandy

bed and becomes almost dry. The area comprised in the drainage basin of this stream and its branches is 90,011 square miles.

On no river in the United States has irrigation been more largely developed or extended to a larger area than on the South Platte and its tributaries. Embraced in its drainage system are many populous cities and towns and the richest farming communities in the state. The area under ditches and canals diverting water from the main Platte and its tributaries in Colorado, Wyoming, and Nebraska is approximately 2,000,000 acres. In Colorado the area irrigated in 1899 was 711,192 acres, an increase since 1889 of 68.4 per cent. In this section are 38.9 per cent of the total number of irrigated farms in the state.

CULTIVATION OF THE YELLOW LOCUST IN MARYLAND.

BASED ON THE TREE-PLANTING RECORDS OF PRIESTFORD FARM.

BY ALBERT NEILSON.

CONSIDERING the rapidly diminishing supply of timber in Maryland, the consequent increase in price and growing demand for lumber, and the favorable soil and climatic conditions for rapid tree growth, it would seem that our farmers would do well to raise trees for profit, and especially the Yellow (Black) Locust,

The cultivation of the Yellow Locust is comparatively an easy matter. The trees grow rapidly and require very little attention after their third year. Locust fence posts will outlast those made from any other kind of timber grown in the East, excepting, perhaps, the Red Cedar. A *seasoned* locust post when put in the ground will last from

thirty to forty-five years. In addition to being extensively used for posts, the Yellow Locust is also used in ship-building and in making telephone and telegraph poles and pins. For these purposes the Locust has a much greater value than White Oak, and the trees mature much quicker. Locust is sometimes used for cross-ties. It grows at about the same rate as Chestnut, but has a much higher commercial value.

In view of the great demand for this timber, the ease with which it may be grown, and the nearness to markets, the writer feels that it will pay nearly every farmer in Maryland to cultivate the Yellow Locust for profit. Almost any farmer in the state at nominal ex-

pense can have a small locust plantation from which to supply his own fence posts. One acre of young locust trees 15 or 20 years after planting will yield from 3,000 to 4,000 posts, and the second growth will supply another crop before the first posts are worn out. Besides furnishing posts for home use, with proper care these farm plantations will prove a source of income to their owners through the sale of excess materials produced.

By way of illustrating what may be done in the cultivation of the Yellow Locust in Maryland, the following facts taken from the tree-planting records of "Priestford Farm," in Harford county, may prove interesting. The first planting of Yellow Locust on "Priestford Farm" was done in 1826. The seeds



LOCUST LANE PLANTED ON PRIESTFORD FARM IN 1876;
TREES ARE NOW 10 TO 24 INCHES IN DIAMETER.

were planted where the trees now stand. There are notes to show that in 1837 the farm began to cut posts, though up to last year no record had been kept as to the value of the posts used on the farm and sold; but from the first cutting to the present day the farm has not only had plenty of posts for its own use, but a large number has been sold.

The first planting was in lanes or avenues, and in small plantations. In the plantations the trees were set eight feet apart, and in the avenues about four feet. Some of the plantations have disappeared, as they were not fenced in, and the second growth was destroyed by cattle. Where the trees have had protection they have continued to yield crop after crop, and have greatly increased in numbers from volunteers and a little planting, so that now "Priestford Farm" has about 3,000 locust trees, divided up as follows:

510 trees	20 to 76 years old,	12 to 36 in. diam.
580 trees	12 to 20 "	6 to 12 "
1,910 trees	2 to 12 "	2 to 6 "

During the past year a careful record has been kept of cutting and sales. Four hundred trees were cut, and several hundred more were available. Many of the trees cut last year had been allowed to get too old, and there was a certain amount of waste. As a rule, the Yellow Locust should not be allowed to grow over 40 years, the best wood being obtained up to that age.

The results at "Priestford Farm" show that yellow locust trees 8 to 18 inches in diameter can be grown from seedlings in 15 to 20 years. Such trees will yield four to eight posts each, making an average of six posts to a tree. After the first crop is cut the suckers will grow from the stump six feet high the first season.

An estimate for a locust plantation of 10 acres, based upon the writer's experience, would be as follows:

Plowing and preparing the ground, per acre, \$5.....	\$50
Planting 8 feet apart 680 trees to the acre, 10 acres, 6,800 trees or seed in the hill, @ 5c.....	340
10 per cent replants, 680 trees, @ 5c.....	34
Labor planting 10 acres, @ \$2.....	20
Labor for working and cutting for 3 years, @ \$1 per year per acre.....	30
Labor trimming for 3 years, @ \$1 per year per acre.....	30

10 acres of land at a valuation of \$30 per acre, \$300; interest, 6 per cent per year, \$18, for 20 years.....

\$360

\$864

Or a cost of \$86.40 per acre.

At the end of the first 15 years some posts may be cut, poles could be cut sooner; but I believe it would be much more profitable to allow the trees to grow to 18 or 20 years of age. I estimate that the following results can be had at that time: there would be at least 6,000 trees, producing an average of 6 posts to a tree, which would give 36,000 posts of three grades—mortised posts, board-fence and wire-fence posts. From these the financial return would be as follows:

18,000 mortised posts, @ 30c.....	\$5,400
9,000 board-fence posts, @ 20c.....	1,800
9,000 wire-fence posts, @ 10c.....	900
Firewood per acre, \$10.....	100
	<hr/>
	\$8,200

Less cost of making:

18,000 mortised fence-posts, @ 12c.....	\$2,160
9,000 board-fence posts, @ 4c.....	360
9,000 wire-fence posts, @ 1c.....	90
	<hr/>
	2,610

\$5,590

Or a profit of \$559 per acre.

If the timber should be cut for cross-ties and posts, we would have the following results:

6,000 cross-ties, first grade, @ 55c.....	\$3,300
24,000 posts at an average net price of 18c.....	4,320
Cordwood and poles.....	100
	<hr/>
	\$7,720

Less cost of making:

6,000 cross-ties, @ 10c.....	\$600
Cutting wood and poles.....	50
	<hr/>
	650

\$7,070

Or a profit of about \$700 per acre.

I do not take into consideration the first cost per acre for starting the plantation, because that is more than covered by the continuous crops and the number of young trees that can be had for increasing the plantations. The interest on the land would probably be a legitimate charge to be deducted from the profits. More profit could be worked out by using the larger trees for shipyard purposes.

ILLEGAL SHEEP GRAZING IN THE SIERRA FOREST RESERVE, YET WITH A COLOR OF LEGAL RIGHT.

BY JOHN D. LELAND,

Division of Forestry, General Land Office.

MANY complaints have been made that sheep were trespassing in the Sierra Forest Reserve, in California, to the great detriment of the reserve and to interests dependent thereon. Allegations have been made that the Department of the Interior did not enforce the rules and regulations prohibiting sheep from grazing in this reserve, and more or less odium has been cast upon the officers in charge of the matter. It is but just and fair that the general public, the people of California, and the employes of other branches of the public service, who discover the sheep in the reserve, shall be advised as to the responsibility for the large number of sheep that are from time to time found roaming over this reserve.

After having received petitions signed by hundreds of residents and citizens living along the borders of the Sierra Forest Reserve, the value of whose property depends largely upon the amount of water available for irrigation, and much convincing evidence that sheep grazing in the reserve was a detriment to it and to a great majority of the interests depending thereon, the Secretary of the Interior issued an order prohibiting sheep grazing therein. This order was issued under authority of the act of June 4, 1897 (30 Stat., 34-36), which provides that:

"The Secretary of the Interior shall make provisions for protection against destruction by fire and depredations upon the public forests and forest reservations which may have been set aside or which may be hereafter set aside under the said act of March 3, 1891, and which may be continued; and he may make such rules and regulations and establish such service as will insure the objects of such reservations, namely,

to regulate their occupancy and use and to preserve the forests thereon from destruction; and any violation of the provisions of this act or such rules and regulations, shall be punished as is provided for in the act of June 4, 1888, amending section 5388 of the Revised Statutes of the United States."

In response to an inquiry by the Secretary of the Interior as to whether a criminal prosecution to punish a person who grazes sheep in a forest reservation in violation of an order prohibiting the grazing was sustainable, the Attorney General approved the opinion of the Solicitor General in which he stated that such a prosecution would be sustained. The Solicitor General said:

"Any violation of such rules and regulations is, by statute, made an offense punishable as provided in section 5388. By this law the control of the occupancy and use of these reservations is handed over to the Secretary for the purpose of preserving the forests thereon, and any occupancy or use in violation of the rules and regulations adopted by him is made punishable criminally. It seems to me Congress has a right to do that. Suppose Congress had provided that the occupation or use of a forest reservation by any person without permission of the Secretary should be a misdemeanor. Would not this be a valid exercise of legislative power? The present statute does no more. The regulation is reasonable and necessary. It restrains no one in the enjoyment of any natural or legal right. To use the language of Chief Justice Fuller *In re Kollock* (165 U. S., 526, 533):

"The regulation was in execution of or supplementary to, but not in conflict with, the law itself, and was specifically authorized thereby in effectua-

tion of the legislation which created the offense.'

"Your question, therefore, is answered in the affirmative."

Many sheep trespasses occurred in the Sierra Reserve, and many arrests were made. Of certain arrests made, nineteen of the parties pleaded guilty, and fourteen were fined \$5 each, four were fined \$25 each, and one was fined \$50. These nominal fines encouraged a violation of the rules, because the grazing of a band of sheep at a cost of but \$5 made cheap grazing. Some of the parties so fined were the herders of rich sheep-owners, men who have taken every means possible to defy the rules and regulations, and whose actions have been sustained by the courts in California. On several occasions these people have taken sheep into the reserve in violation of orders. On one occasion one of the parties took five herds of sheep into the reserve, and when two of the forest rangers tried to drive out one herd, the owner and his herders, with threats and show of firearms, took the sheep away from the rangers and defied orders to remove the sheep. They were arrested and held to answer. When the time came for trial before Judge Wellborn, of the southern district of California, 35 cases were pending. A demurrer to the criminal information was filed by the defendants, and Judge Wellborn sustained the demurrer, holding that the act under which the rule prohibiting grazing was made, in so far as it declares to be a crime a violation of the rules, was unconstitutional, in that it delegated legislative power to an administrative officer. As a result of this decision all criminal prosecutions in Judge Wellborn's jurisdiction were discontinued.

Commenting upon this decision, the Attorney General said (see his Annual Report for 1900, page 40):

"Under the present procedure it is impossible for the government to have the decision of the district court reviewed, although it is the opinion of the district attorney having charge of the case, and of the Attorney General, that the decision was erroneous and ought to be reversed."

Several arrests for sheep trespass in the forest reserves of Arizona were subsequently made, and on March 25, 1902, in the district court of the fourth judicial district of Arizona, nine indictments were presented against parties charged with the crime of pasturing sheep on the public lands in a forest reservation. The defendants filed a demurrer, as in the California case, which the court overruled, and a verdict of guilty was found and fines were imposed. In these cases one, as a test case, was appealed by the defendant to the supreme court of the territory and is now pending.

Civil suits for damage were also brought against the defendants in the California cases for the trespass on which the criminal proceedings were based, and they entered demurrers to the complaints on two grounds: first, that the state law gave stockmen the right to graze on the public domain unless fenced; and, second, that the privilege of grazing on the public lands had been so long conceded that it had become a right. Judge Wellborn, on May 7, 1901, overruled the demurrers and required the defendants to answer the complaints. Within a few days thereafter four parties again took sheep into the reserve, and injunctions were asked for on the part of the government. At the hearing the defendants alleged that they were going to private land holdings within the reserve with their sheep, and had the right of ingress and egress, and the right to pasture on the reserve because no injury would result therefrom. The court, however, on July 31, 1901, enjoined them from driving, pasturing, herding, or grazing sheep upon the reserve lands, or in any way doing injury thereto: *Provided*, That in the use of the private lands situated within the said reserve in the pasturing and grazing of sheep thereon (said land amounting to 9,240 acres, and which is referred to and described in the affidavits filed in other actions) they desist from unnecessary and wrongful delay in going from one tract to another of such private holdings, and also in leaving the reserve at the end of the summer season.

This was all that these people re-

quired to accomplish their ends for the grazing season of 1901; but to get back into the reserve in 1902 they asked a modification of the order of July 31, 1901, so as to allow them to enter the reserve, cross the public lands, and reach the alleged private holdings. I say *alleged* advisedly, for in many instances the title to the land and the right to use it is only alleged, and is not and does not exist in fact. The fact that it was simply an allegation, which would not in all cases be borne out by the facts, was laid before the court, but the judge decided that the petitioners should have the benefit of the doubt as to the title to the land they claimed to have leased or to own, and on May 7, 1902, modified his order of July 31, 1901, so as to allow the entry of the sheep again in 1902, allowing four sheep to each acre owned or leased by the defendants.

Four sheep to the acre! Think of that, and then say that the Sierra Forest Reserve is not an ideal grazing ground. My information is that it is an exceptional tract that will support more than a sheep per acre for the grazing season, and that usually two, three, and even four acres are required to sustain a sheep. In no regular application coming before the Department of the Interior has the applicant asked to take into his private holdings more than one sheep to the acre.

The swamp and overflowed lands in California were granted to the state, but until the state receives its patent, or the legal equivalent, a certification of the lands to the state by the federal government, the surveys may be questioned and the grant simply remains in process of adjudication, and the jurisdiction over the land is in the Land Department. Except as shown hereafter, not a single acre of the lands claimed has been patented to the state. In many instances the state, assuming that the surveys showing lands to be swamp lands would be accepted as correct, has sold these lands before the claim has been adjudicated. There have been fraudulent surveys, of which the state was informed, notably the Benson surveys; yet the state has set up claims to lands

shown by these surveys to be swamp lands and has sold or leased them. It is these alleged swamp-land claims principally that these defendants claim the right to use—whether by *purchase* or *lease* from the state I am not advised. Some of the tracts claimed by these defendants have been sold by the state to *other* parties, who have used them as bases for lieu selections, the tracts having been redeeded to the United States. In these cases, if the swamp-land claims are good, the deeds will be accepted and the title to the lands will remain in the government. If the swamp-land claims are found not to be good the said deeds will be refused, because the land did not pass out of the United States under the swamp grant. How, then, under any conditions, can these defendants have any right to use *these* tracts?

In other cases the state sold lands, and the parties to whom sold used the lands as bases for lieu selections. These lieu selections were held for rejection, because the base lands did not pass to the state under the swamp grant, the survey being fraudulent, and the right of appeal was given. No appeal was taken, and the case was closed. The state could not thereafter assert any title thereto; yet these very lands are among those claimed by one of the defendants.

Under the school-land grant each surveyed section 16 passed to the state *in presenti*.

These defendants assert a claim to the S. $\frac{1}{2}$, sec. 16, T. 7 S., R. 26 E., presumably under lease or purchase from the state. The state, however, had sold this land to other parties, and it has been redeeded to the United States as a base for lieu selection. As to the other tracts in question, the state has never advised the General Land Office that it is laying any claim to them. If it is making any such claim, it is probably relying upon the surveys as indicating their swampy character. It is possible that the state may have good claims to some of these tracts, but until such claims, if any exist, are tested by an examination of the Land Office records, as in the cases cited above, which cases show that the court allowed these defendants to

take sheep into lands actually owned by the United States, much injustice will be done by the court decisions.

The rules of the Department of the Interior relative to the use of private lands within a forest reservation for grazing purposes are as follows:

"Persons who own, or who have leased from owners, lands within any reserve which they desire to use for grazing purposes, and who must cross the reserve lands with their stock to reach such private holdings, must make application to the supervisor for the privilege of crossing. The application must be accompanied with an abstract of title showing the ownership of the land and, if leased from an owner, a certified copy of the lease, and must state the number of stock to be taken in, the length of time required to cross the reserve land, the route over which the stock is to be driven, and the date of starting, and the time when the stock will start out again; also how much stock the owned or leased lands will carry during the period it is proposed to keep the stock thereon. When any such application is made to the supervisor, he will examine it with care, and if he finds it reasonable and just and made in good faith for the purpose of utilizing such private holdings only, he will approve the same and forward it to the Commissioner of the General Land Office. After the Secretary approves the application, due notice thereof will

be given the applicant, through the supervisor, and he may then take his stock in . . ."

These rules and a statement showing the doubts as to ownership of the lands claimed were before the court when it decided to accept the evidence of the defendants, and to give them the benefit of the doubt as to ownership.

The order of the court, made without applying the test required by the department rules, gives these four defendants the right to take 28,784 sheep into the reserve, with the right to cross the public lands back and forth to reach 60 disconnected tracts of land located in 65 different sections and in 15 different townships.

Any man having a meritorious case who will comply with the rules will obtain all his rights promptly without going to court. The General Land Office recognizes the right of ingress and egress to private holdings within a forest reserve, and any good-faith use of these holdings is in no way discouraged; but when a man wants to take 4,000 sheep to 1,000 acres which would not support 500 sheep during the grazing season, and applies to go over the public lands for a distance of 50 miles, when he could reach the land by a regular route of not over 25 miles, and when he is not certain that he has the right to use more than one-half of the 1,000 acres he is going to, the Land Office is not the place to apply to.

NOTABLE IRRIGATION WORKS.

II.—A MODEL FARM IN TEXAS.*

ON the outskirts of San Antonio, Texas, is located possibly one of the most successful, as well as one of the most lucrative, small farms in the entire South.

In addition to being a practical demonstration of the success of irrigation as applied to the growing of garden truck in the semi-arid district of Texas,

it is a monument to the enterprise and faith of Mr. F. F. Collins, its promoter and owner. It is an object lesson in intensive agriculture, and, aside from manifesting the fertility of soil and the presence of artesian water in great supply, it has proven to the growers and others of western Texas the wonderful element of profit which attends intelli-

*The text and illustrations of this article are reprinted here through the courtesy of the Southern Pacific Railway Company.



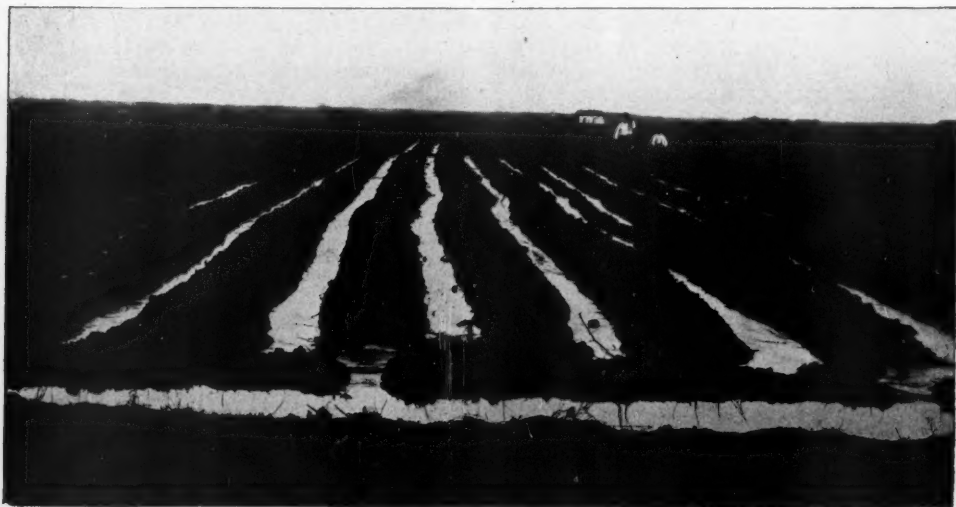
WELL, FLOWING ONE THOUSAND GALLONS PER MINUTE.

gent agriculture in the matter of providing for the tables and appetites of the public generally.

Irrigation has made southern California highly productive, it has given life to the barren sands of central Arizona, it has brought wealth to the farmers of Colorado, and is making fortunes

for the rice-growers of Louisiana and Texas.

It is not new in any particular sense, and yet the experiment of Mr. Collins has in a manner extended the area possible of irrigation and brought into being a series of conditions which will inure to the benefit of the country in



SHOWING METHOD OF IRRIGATING THE FURROWS.

and about the Bexar county metropolis. So remarkable have already been the results that the rich, black mesquite plains on the outskirts of San Antonio have doubled in value in the past six months, reaching, during January, \$100 per acre. The change has been due to the sinking of a 6-inch well six hundred feet and finding a water stratum that runs 1,000 gallons per minute of pure, clear liquid, with a temperature of 74 degrees.

F. F. Collins has for many years been identified with the development of Texas. Seeking the country contiguous to San Antonio immediately after the civil war, he commenced his new life in the wastes devoted to the long-horned Texas steer. He was the first man to urge the sinking of artesian wells in the dry sections and to introduce the windmill as motive power. He was practical and enterprising, and, in order to prove the truth of his theory, brought a well-borer from the Middle States which he used to put down a well. Water was found, the windmill distributed it among the shallow earth tanks, and his theory was an accomplished fact.

Mr. Collins first, from a theoretical standpoint, was considerably interested in the development of the intensive system of farming practiced by the peasantry and skilled market gardeners of France, Belgium, and Italy. During the past few years, in order to follow out the investigations he had decided upon making in regard to irrigation, he visited the chief countries of the world in which market gardening and irrigation were practiced, either jointly or as a general feature of agricultural development. From close observation he became convinced that the peasants of the three countries named made the best market gardeners.

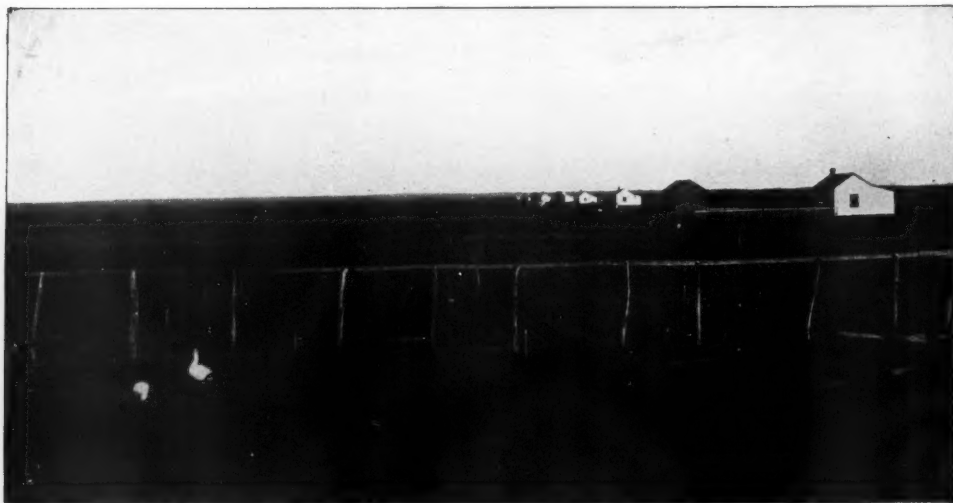
Returning from his travels, Mr. Collins began to put his plans into operation. Purchasing 148 acres of ground in the immediate outskirts of San Antonio, he put down the two wells which made his venture a success and proved conclusively that sufficient water could be secured at a reasonable depth. The area purchased by Mr. Collins was virgin

mesquite prairie, having a sufficient slope to permit the water to reach all portions of the field purely by gravitation, and enabling the furrow system of irrigation to be put into execution.

The first well driven by Mr. Collins was a 10-inch pipe, which, at a depth of 600 feet, tapped a stratum of water-bearing rock. A measurement of the volume of water which flowed from the mouth of the well gave the output at 1,000 gallons per minute. Somewhat elated by his success and desiring an additional supply of water, he put down another well some forty feet from the first, but with a 12-inch casing. Water was reached at the same level, but, to his surprise and chagrin, he found that the combined output of the two wells but equaled the flow from each individual well, it being evident that the vein could not supply water fast enough of its own pressure to double the output of the first well. The water secured, however, was sufficient to irrigate 400 acres, and, aside from the fact that \$3,500 had been expended unnecessarily, the lack of an additional water supply did not interfere with the project.

Dividing his farm into plots of $12\frac{1}{2}$ acres each, he built on each plot a small three-roomed house and a good barn, conducted water pipes from a four-million-gallon reservoir, into which the surplus water was forced by its own pressure (the head of the water being 20 feet above the surface), thus supplying prospective tenants with an unlimited quantity of fresh water for household use. The farm was of such shape as to permit an equitable division of the territory, so that the cottages all faced its northern boundary. The main avenue to the plots followed the boundary fence directly in front of the cottages.

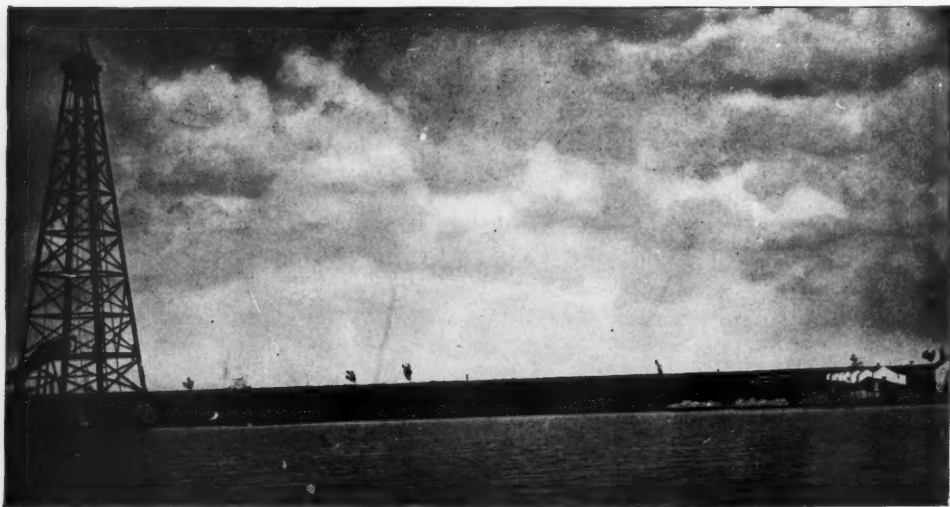
The work of clearing the land of its mesquite timber was begun during the fall of 1900, and the grubbing and removal of the mesquite roots was completed in time to permit the tenants to begin operations early in the spring of 1901. By this time Mr. Collins had secured a full complement of market gardeners, among the lot being Germans, Belgians, and Italians, with a Mexican



VIEW SHOWING TENANTS DWELLINGS.

or two and several Americans. This afforded him an opportunity of judging each nationality in the matter of thrift and industry, and, while not particularly pleased from a sentimental standpoint, he reached the conclusion that the tenants most desirable were those from Belgium and Italy, and at the be-

ginning of 1902 his entire tenantry was made up of thrifty representatives from the two countries mentioned. He found that, while the American did not lack the ability, he usually wanted some one else to do the work while he sat on his front gallery and smoked a pipe. The Mexican was found to be naturally too



ONE OF THE RESERVOIRS.

shiftless, when left to his own guidance, to make even a moderate success.

At the end of the first year Mr. Collins had reached the conclusion that irrigation of garden truck in the magnificent black loam of San Antonio, the soil being fully three feet in depth, was not only perfectly feasible, but offered a splendid return on the investment. His enterprise netted him 14 per cent., and his tenant leases for 1902 are based upon the same figures.

The rent per acre is fixed at \$22.75, which includes a residence, barn, and water. Deducting \$2.75 for the land tax, leaves a net return of \$20 per acre, a price which under ordinary conditions would be very high, but which in the present instance is not in the least extortionate, in view of the splendid opportunities for profit afforded the tenants of the Collins farm. In order to prove this is so, it will only be necessary to quote a few instances of individual gain by some of the tenants of Mr. Collins, and this illustration will also serve to indicate the wonderful fertility of the black mesquite soil when crops are given water at the proper time, and are also given careful cultivation.

One tenant, who devoted a portion of his plot to corn for market consumption, raised 90 bushels per acre as the first crop, and as soon as the crop had been harvested, at once planted a second crop on the same land, which yielded 50 bushels, or a total of 140 bushels per acre in a single season.

Another tenant, who planted part of his field in Irish potatoes, sold the crop at a rate of \$250 per acre. As soon as the first crop was removed he planted the land in sweet potatoes, which he harvested late in the fall, and which

netted him \$275 per acre, or a total of \$525 per acre from the potatoes. At least \$100 per acre was realized from smaller vegetables planted in the same plot, thus making a total of \$625 per acre for this particular portion.

A German tenant, from the proceeds of his entire year's work, paid the expenses of a family of five, including stock feed for the entire year, and at the end of the season had in the bank \$3,600.

On an experimental acre devoted to sugar cane 40 tons were raised with an imperfect system of cultivation, due to a lack of familiarity with the methods employed by sugar planters generally.

Another acre devoted to the cultivation of cotton yielded one bale of the staple, although fully one-half of the crop was destroyed by the Mexican boll weevil. Mr. Collins said the yield on this acre, had it not been for its partial destruction, would have been fully two and one-half bales—a wonderful yield, all things considered.

Mr. Collins has recently purchased another tract of land separated from the Collins farm, and is now clearing this with a view to putting into execution the same system he now employs. He has constructed a reservoir which will have a capacity of 8,000,000 gallons of water, which, added to the first reservoir near the wells, will give Mr. Collins a surplus of 12,000,000 gallons of water to be applied as he may direct. In the meantime both reservoirs will be stocked with black bass, and will thus afford the owner considerable sport in the course of a year or two.

The experiment of Mr. Collins will undoubtedly be followed by a number of enterprising landholders in San Antonio.

THE WATER RESOURCES OF THE SOUTHERN APPALACHIAN MOUNTAINS.

INTEREST in the Southern Appalachian Mountain region has become general during the past three years, mainly through the efforts of public-spirited citizens to have a por-

tion of the forested lands of this region set aside as a national forest reserve. The matter of establishing a forest reserve in this section has been pushed vigorously in Congress, and at the last

session a bill for this purpose passed the Senate. Consideration of it in the House was prevented through lack of time. However, the bill will be taken up again by the House during the next session, and there is a reasonable prospect of its becoming a law.

Much has been written about the forests of the Southern Appalachians, especially since the campaign for the reserve was begun. A recent valuable publication* by the U. S. Geological Survey, contains a description of the water supply of the region and emphasizes the importance of the streams in the development of the country. This report was prepared by Mr. Henry Albert Pressey, and is the result of a systematic measurement of the water supply from this area.

* Hydrography of the Southern Appalachian Mountain Region. By Henry Albert Pressey. Parts I and II. Being Water Supply Papers 62 and 63. Illustrated with 44 half-tone plates from photographs. Published by U. S. Geological Survey.

In the report it is shown that this great mountain system stretches from Maine southwesterly for nearly 1,300 miles, terminating in northern Alabama. From the Potomac south the ranges are higher and broader than in Pennsylvania. They spread out into the Blue Ridge, the Shenandoah, the Alleghany, and Greenbriar Mountains, extending, with broad and fertile valleys between, in nearly parallel lines through Virginia and West Virginia into North Carolina and Tennessee, and culminating in the Iron and Great Smoky ranges, the great mountain region of the southeastern states.

In this southern mountain mass 63 peaks equal or exceed a height of 6,000 feet, 25 peaks are higher than Mount Washington, and 288 peaks are over 5,000 feet. From North Carolina and Tennessee the ranges, leaving spurs in South Carolina, turn more westward through Georgia and Alabama, and sink into the hills of the gulf water-



TYPICAL FOREST-COVERED MOUNTAIN SIDE.

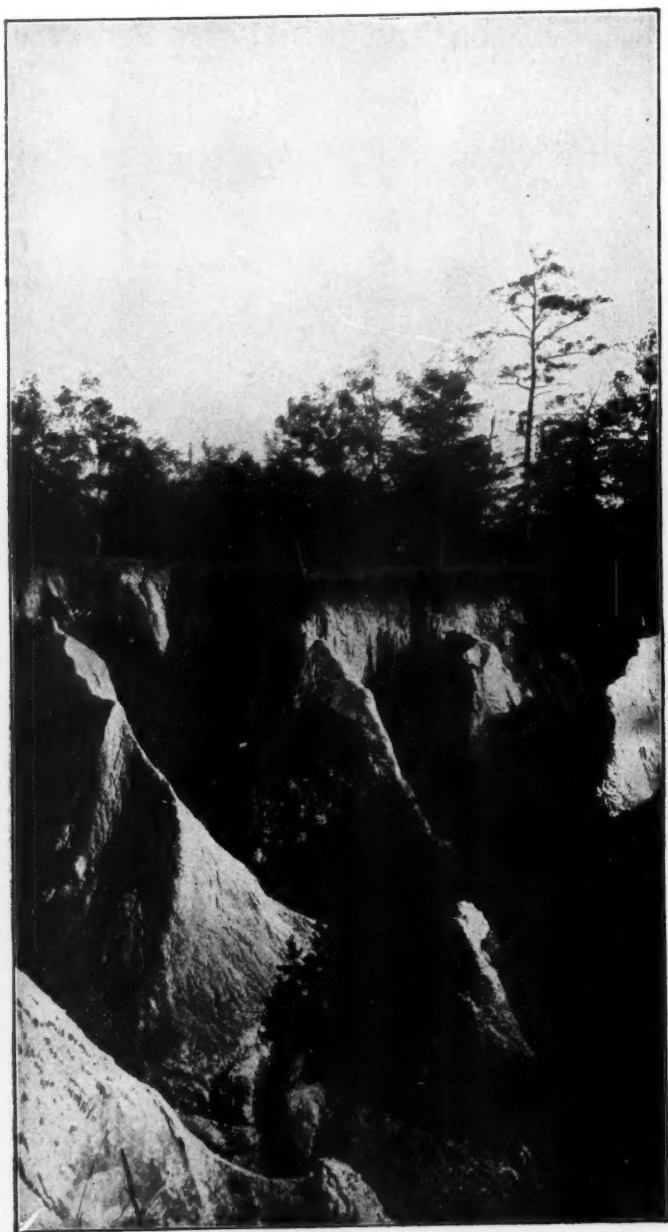


VIEW OF A DEFORESTED HILLSIDE, SHOWING EFFECT OF EROSION, SOUTHERN APPALACHIAN REGION.

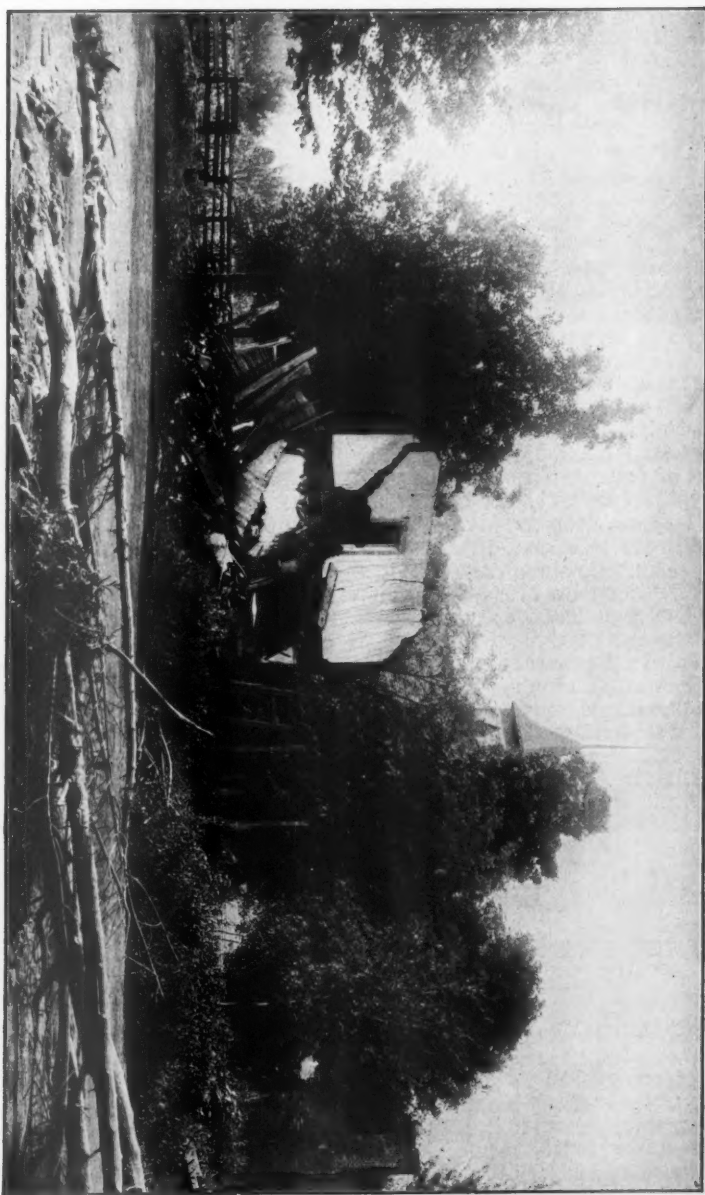
shed. This great mountain system forms the backbone and watershed of the eastern part of the United States. The greatest masses and the highest peaks are in western North Carolina and eastern Tennessee, which region may be considered a high plateau, bounded on the west by the Smoky Mountains and on the east by the Blue Ridge. These ranges, almost touching on the north, part company, and then almost come together again in the south, thus enclosing this upland plateau, which has a maximum width of 55 miles and an area of about 6,000 square miles.

The report further shows that the entire region is well watered. The main divide of the river systems is the Blue Ridge. The States of Virginia, North Carolina, South Carolina, Georgia, Alabama, Tennessee, and West Virginia are partially watered by rivers rising in the mountains near the North Carolina and Tennessee state lines. One of the principal tributaries of the Ohio and one of the largest feeders of the Mississippi head in the same mountains, and the region may be justly termed one of the

chief watersheds of the United States. Grandfather Mountain, at the junction of Watauga, Mitchell, and Caldwell counties, in North Carolina, probably the most massive of the Southern Appalachians, may be taken as the center of this watershed. Thence the waters pour north, east, south, and west. From the many other springs on the southern slope of Grandfather Mountain flow some of the headwaters of the Catawba, which, rising in the Black Mountains and descending in leaps of from 5 to 100 feet to the Piedmont Plain, likewise crosses into South Carolina and, as the Wateree, passes on to the Atlantic. Flowing from this region into the Atlantic, besides the Catawba, are the Yadkin, Broad, Saluda, Chattooga, Tugaloo, and Oconee; into the Gulf are the Chattahoochee and the Coosa; into the Mississippi are the New River and the Tennessee. From the western slopes of the Blue Ridge flow the headwaters of the great Tennessee River system, as do its larger tributaries, the Holston, the Nolichucky, and the French Broad.



WATER-WASHED GULLY, MCDOWELL COUNTY, N. C.



VIEW SHOWING EFFECT OF FLOODS ALONG NOLICHUCKY RIVER.

The scenery of the Southern Appalachian region is the grandest in the eastern states. The mean annual temperature varies from nearly 60° F., at Salisbury, N. C. (altitude, 760 feet), east of the mountains, to 49° F., at Linnville (3,800 feet), the latter being the mean annual temperature of Boston and Chicago. The annual rainfall is copious, especially on the eastern slopes of the mountains. At Highlands, in Macon county, the annual normal precipitation is about 72 inches; at Asheville it is about 42 inches.

In regard to the timber resources, Mr. Pressey states that, notwithstanding the inroads that have been made on the forests that once covered nearly the whole of these mountains, nowhere in the United States is there an equal area of land covered with so great a variety of valuable timber. The walnuts, tulips (poplars), and oaks reach their best development here. White Pine also occurs in considerable quantities. Lumbering on a large scale has been carried on for only a few years, but it is very destructive; some of the companies saw anything that will make a plank. In the case of the bark-gatherers the waste is even more deplorable and ruinous. However, it was found that this section is moderately free from forest fires. Iron ore occurs in large quantities in a number of counties; copper, mica, corundum, gold, and other

minerals have been mined to some extent.

The drainage basins, discharge measurements, and water-powers of the various rivers and their tributaries are described at length by Mr. Pressey, and much information of value to millers, lumbermen, miners, stock-raisers, farmers, and travelers is to be found in this report.

Mr. Pressey insists upon the importance of the forests to the preservation of the soil of this region, and notes with satisfaction that the heavy forest growth on Grandfather Mountain is not to be destroyed. In order that the springs which give rise to so many streams on Grandfather Mountain may not be disturbed, 1,400 acres have been set aside as a public park, by the Linnville Improvement Company, under five commissioners, one of whom is the Commissioner of Agriculture of North Carolina, and another the State Geologist, Prof. J. A. Holmes, with whose active assistance the surveys and examinations described by Mr. Pressey were made.

Altogether this well-prepared report contains an excellent description of a region which is now attracting the attention of the entire country. It should be of great value in making known the many natural resources of the Southern Appalachian region. It is well written and deserves to be widely read.

IRRIGATION IN FLORIDA.

ANOTHER EXAMPLE OF THE VALUE OF IRRIGATION IN THE HUMID REGION.

IRRIGATION occupies a position of growing importance in the agricultural economy of Florida, though it is a comparatively recent innovation, having been first resorted to in 1888 by the orange-growers. The results were apparently so satisfactory that the number of irrigators has increased from year to year.

Until the disastrous "freeze" of 1894-'95 irrigation was confined al-

most wholly to orange groves, but with the destruction of thousands of orange trees many of the irrigation systems were thrown out of use, and the attention of irrigators was turned to the industry of truck farming. In this industry the need of irrigation was quickly felt, as the products of truck farms are of large commercial value, and even a partial loss of crops is very costly. The cultivation of fruits and

vegetables has proved most profitable, and the development of these branches of agriculture has been very rapid, giving a great impetus to the use of irrigation. At the present time by far the greater number of irrigation systems in the state are used by truck farmers and growers of small fruits.

Although it has a heavy mean annual rainfall, Florida is subject to severe drouths, especially during the growing period between February and June. In the sections where irrigation is reported the soil is naturally non-retentive of moisture, and, owing to the great heat, evaporation is excessive.


The state appears to be underlaid by artesian waters at depths varying from 25 to 500 feet below the surface. Where these waters have been tapped the supply is found to be ample, many of the wells flowing with considerable pressure and great volume. In most cases no cost for pumping is entailed in irrigation, and the expense of maintaining the plant is very slight. The usual cost of one well, including drilling, casing, cement pipes, and everything required to complete a plant capable of irrigating 10 acres, is about \$500.

The system employed on the leading farms is as follows: continuous underground cement pipes are laid from the wells to hydrants, plugs, or standpipes, from which the water is distributed in small furrows between rows. These pipes are made and laid at the same time by a machine, in trenches previously prepared, and extend without break to any desired part of the field. The pipe itself is composed of two parts sand and one part cement, with a usual inside measurement of three inches, and an outside measurement of six inches, and costs about 10 cents per foot. In a few localities the water is pumped by

windmills into tanks, whence it is distributed over the land through iron pipes or wooden troughs. Gasoline engines and rotary pumps are sometimes used instead of windmills. A well, with its equipment of gasoline engine, rotary pump, and iron pipe sufficient to irrigate three acres, costs about \$500. Using gasoline, at 14½ cents per gallon, as a fuel, such a plant will deliver 2,000 gallons of water per hour, at an average cost of 4 cents per hour.

The most extensive irrigation systems in the state are located in Gadsden county, and belong to two companies engaged in the cultivation of Sumatra tobacco. The cost of constructing these plants, which irrigate 250 acres of tobacco, was \$36,250. In 1899 the value of the tobacco grown was \$91,000, or an average of \$364 per acre. The water for these plants is pumped by steam from several small creeks into reservoirs, from which it is distributed through ditches by gravity. One of the companies has perfected an elaborate plan of distribution through troughs and overhead sprays, the water being applied in a manner very similar to that of natural rainfall.

Among the humid states where irrigation was practiced in 1899, for general crops, Florida ranked first in the area irrigated, in cost of plants, and in value of irrigated crops. In that year there were 180 irrigated farms, 166 of which reported irrigated products. On 14 farms, 53 acres of non-bearing orange trees and pineapples were irrigated. Forty-three irrigation systems, representing an aggregate cost of \$78,525, and covering 751 acres, were not operated in 1899. The value of the products of the 1,485 acres irrigated was \$302,870, or an average of \$203.95 per acre. The total cost of the pumping systems, ditches, and wells was \$232,388, or an average of \$101.52 per acre.



RECENT PROGRESS IN DENDRO-CHEMISTRY.

REVIEW OF RECENT ARTICLES IN LEADING CHEMICAL JOURNALS.

BY WILLIAM H. KRUG,

Bureau of Chemistry, U. S. Department of Agriculture.

WHITE Peru Balsam. A. Biltz (Chem. Ztg., 26, 436). Author reports preliminary results of his investigations. He has isolated: (a) A white body insoluble in absolute alcohol and ether, M. P. = 120°-130° C., soluble in benzol, acetic ether, and chloroform; (b) free cinnamic acid; (c) a compound soluble in 5 per cent sodium carbonate solution, crystallizing from dilute alcohol in needles, M. P. = 260° C., and (d) a brownish-yellow body which can be extracted with 1 per cent potassium hydrate solution and on saponification with alcoholic potash yields cinnamyl alcohol, cinnamic acid, and a colorless, pleasant-smelling oil, $C_{20}H_{30}O$ or $C_{20}H_{28}O$, B. P. = 112° C., $D^{17.5} = 0.9433$.

West Indian Sandalwood Oil. Ernst Deussen (Arch. d. Pharm., 240, 288). The author has continued his investigations, and by fractionation of the lower boiling portions of the oil has obtained two distillates which consist of sesquiterpenes. The new sesquiterpene, $C_{15}H_{24}$, is an odorless oil, B. P. = 139°-141° C., $D^{15} = 0.902$, (a) about -5°. The higher boiling sesquiterpene is dextro-cadinene, $C_{15}H_{24}$, odorless and colorless liquid, $D^{15} = 0.9247$, $a = +50^\circ$, $n_D = 1.5108$, B. P. = 260°-261° C., B. P. = 153°-154° C. This sesquiterpene resinifies more readily than levo-cadinene and yields the hydrochloride of the latter when treated with hydrochloric acid. Between these two hydrocarbons there is another fraction consisting of sesquiterpenes, which also resinifies very readily and yields no crystalline hydrochloride, B. P. = 150°-152° C., $D^{15} = 0.914$, $a = +10^\circ$ -15°. West Indian sandalwood oil contains from 30-40 per cent of sesquiterpenes.

The Formation of Camphor in the Camphor Tree. A. Tschirch and H. Shirasawa (Arch. d. Pharm., 240, 257).

Camphor is a conversion product of an ethereal oil formed in the oil cells present in all parts of the tree. These cells are present very early in the life of the tree, and are developed as in the other Laurinaceæ. At first the oil in the cells is yellow, later on colorless, and easily volatilized. In the latter condition it readily separates camphor, and from the oil cells the camphor is distributed throughout the whole woody tissue. The number of oil cells depends on climatic conditions and the locality.

The Resin of *Picea vulgaris*. A. Tschirch and M. Koch (Arch. d. Pharm., 240, 272). The crude resin was soluble in ether, leaving a considerable residue, consisting of impurities. The purified resin was a reddish-brown mass, soluble in alcohol, benzol, chloroform, acetic ether—acid number, 115-123; saponification number, 129; iodine number, 54.36. Dry distillation yielded formic, acetic, and succinic acids. The purified resin was found to contain (a) picipimaric acid, 3 per cent, $C_{12}H_{20}O_2$; amorphous powder, M. P. = 130°-135° C., soluble in ether, alcohol, benzol, insoluble in water—acid number, about 288; iodine number, 64; (b) piceapimaric acid, 2 per cent, $C_{20}H_{30}O_3$; crystalline, M. P. = 145° C., inactive; soluble in usual solvents—acid number, 187; iodine number, 35.5; (c) α - and β -picipimarolic acids, 47 per cent, both inactive, amorphous, separated by means of their lead salts, α -acid M. P. = 95°-96° C., β -acid M. P. = 93°-94° C.—acid number, 200-207; iodine number, 46; (d) picorene, 15 per cent, $C_{19}H_{30}O$; white powder, M. P. = 90°-95° C.; soluble in usual solvents; (e) ethereal oil, 30 per cent, B. P. = 175°-180° C., $D = 0.870$, yellow, mobile; (f) traces of a bitter principle and a coloring matter.

Elemi. A. Tschirch and J. Cremer (Arch. d. Pharm., 240, 293). The elemis may be classified in two groups—one which on mixing with alcohol shows crystalline constituents, and one which under these conditions remains amorphous. All elemis are derived from Burseraceæ. The Manila elemi is obtained from *Canarium*, the Brazilian from *Protium*, the Yucatan from *Amyris*, the former East African from *Boswellia*, and the present East African probably from *Canarium*. The authors have studied a *Canarium*, a *Protium*, and an *Amyris* elemi.

1. Manila elemi, soft, almost white, soluble in ether, chloroform, etc.—acid number, 20–22; saponification number, 29.5–33.5. It was found to contain: (a) α -maneletic acid, $C_{37}H_{56}O_4$, crystals, M. P. = $215^\circ C.$ —acid number, 102–106; saponification number, 190–204; (b) β -maneletic acid, $C_{44}H_{70}O_4$, amorphous, inactive, M. P. = 75° – $76^\circ C.$ —acid number, 90–96; saponification number, 112–118; (c) α - and β -amyrin whose properties have been described by Vesterberg; (d) bryoidin, $C_{31}H_{48}O_3$, 1 per cent, M. P. $135.5^\circ C.$, inactive; (e) a bitter principle, 1–2 per cent; (f) an ethereal oil, 20–25 per cent, B. P. chiefly 170° – $175^\circ C.$, $D=0.955$; (g) maneleresene, $C_{15}H_{30}O$, 30–35 per cent, white amorphous powder, M. P. 63° – $65^\circ C.$ This elemi was obtained from *Canarium commune*, L.

2. Yucatan elemi. Obtained, according to Henkel, from *Amyris elemifera* Royle; contains no resin acids. The following constituents were separated: (a) Yucamyrrin, 10–15 per cent, which was separated into α - and β -amyrrin, M. P. = $179^\circ C.$; (b) yuceleresene, $C_{23}H_{40}O$, 60–70 per cent, M. P. = 75° – $77^\circ C.$; (c) ethereal oil, 8–10 per cent, $D=0.945$; (d) a bitter principle.

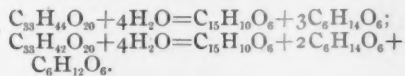
African elemi (*Kamerun elemi*). Recently introduced, probably obtained from *Canarium schweinfurthii* Engl. Constituents: (a) afelemic acid, 8–10 per cent, $C_{44}H_{70}O_4$, white amorphous, M. P. = 97° – $98^\circ C.$, soluble in usual solvents—acid number, 81–90; saponification number, 100–104; (b) afamyrrin, 20–25 per cent, $C_{30}H_{50}O$, needles, M. P. = $170^\circ C.$; (c) ethereal oil, 15–20

per cent, $D=0.953$, B. P. chiefly 160° – $175^\circ C.$; (d) afelesesene, 40–45 per cent, $C_{30}H_{50}O_3$, M. P. = 70° – $73^\circ C.$

Analysis of Tanning Materials: Filter Papers and Soluble Solids. H. C. Reed (Journ. Soc. Chem. Ind., 21, 691). S. and S. filter papers No. 590 give the most satisfactory results. The filter must be kept full during filtration, and clear filtrates are always obtained when 2 grams of kaolin are used as an assistant. The author recommends the general adoption of the official method used in the United States and the exclusive use of S. and S. filter paper No. 590.

The Solubility of some Soft Resins. Ch. Coffignier (Bull. Soc. Chim., Paris (3), 27, 549). The literature contains many contradictory statements on this subject. The question is of considerable importance in the manufacture of varnishes, and the author has determined the solubility of dammar, sandarac, and mastic.

Robinin, Violaquercitrin, Myrticolarin, and Osyritrin. A. G. Perkin (Journ. Lond. Chem. Soc., 81, 473). Robinin is prepared by extracting the flowers of *Robinia pseudacacia* with hot alcohol, concentrating the extract, and pouring it into water. The residual alcohol is removed by distillation and the resulting aqueous solution is extracted with ether. Robinin has the formula $C_{35}H_{42}O_{10}$ or $C_{33}H_{41}O_{10}$. It is hydrolyzed by acids, the products being campherol, small quantities of dextrose, and rhamnose (not galactose, as previously stated). The dextrose may be due to the presence of traces of another glucoside. The hydrolysis of the robinin is therefore represented by one or the other of the following reactions:



Investigations on Brasilin. St. v. Kostanecki and V. Lampe (Ber. deutsch. chem. Ges., 35, 667); and E. Bollina, St. v. Kostanecki and J. Tambor (Ber. deutsch. chem. Ges., 35, 1675.)

The Nature of Caoutchouc. C. O. Weber (Ber. deutsch. chem. Ges., 35, 1947).

Larch Turpentine and Venetian Tur-

pentine. L. E. Andes (Chem. Rev. Fett- und Harz- ind., 9, 6, 126). A brief review of the properties, forms of adulteration and substitution, and methods proposed for the detection of same. The article presents no new facts.

Genuine Japanese Rhus Lacquers. (Oesterr. Farb- und Lack- ztg., 1902, No. 4.)

Analysis of Spent Alkali Liquor from the Soda Process. M. L. Griffin (Journ. Am. Chem. Soc., 24, 3, 235).

Oleo-distearin in the Fat of the Seeds of Theobroma Cacao. R. Fritzweiler

(Arbeit. a. d. kaiserl. Gesundh. Amte, 18, 371). Heise first found this mixed glyceride in the Mkanji fat of *Stearodendron stuhlmanni* Engl., and the Kokum butter of *Garcinia indica* Choisy. The author has obtained it from cacao butter. Two hundred and fifty grams of the fat were dissolved in a mixture of 150 cc. ether, 150 cc. chloroform, and 150 cc. alcohol. The second deposit of crystals obtained was purified, and finally had the melting point 42.2-42.5 C. and was neutral. The analytical data show it to be oleo-distearin.

RECENT PUBLICATIONS.

Insect Enemies of the Pine in the Black Hills Forest Reserve. By A. D. HOPKINS, Ph. D. Bulletin No. 32, new series, Division of Entomology, U. S. Department of Agriculture. Pp. 24. Plates VII, Figs. 5.

The work reported in this bulletin by Dr. Hopkins was undertaken at the request of Mr. Gifford Pinchot, Chief of the Bureau of Forestry, and under instructions from Dr. L. O. Howard, Chief of the Division of Entomology.

The investigations in the Black Hills Forest Reserve were conducted in company with Mr. Pinchot and Mr. Griffith, a field assistant in the Bureau of Forestry. In traversing the Black Hills Reserve vast numbers of Rock Pine (*Pinus ponderosa scopulorum*) were observed that were dying or had died within recent years, of sizes ranging in diameter from 4 inches to the largest trees. The dying trees were found to occur in clumps of from a few examples to many hundreds.

Mr. H. S. Graves estimated in 1897 that about 3,000 acres of pine in the Black Hills Forest Reserve had been killed. Further data furnished by the Bureau of Forestry show that the actual amount of dead timber, as determined by a detailed survey of the timber resources of the reserve in 1901, is "an average stand of 1,956, feet board measure, of bug-killed timber on 116,000 acres, giving a total of 226,890,000 feet, board measure."

It is the general opinion among settlers and others who have had an opportunity to note the conditions affecting the pine that the dying timber commenced to attract attention about six or seven years ago, or about 1895. The evidence found by the writer in old dead standing and felled trees, indicates that the pine-destroying beetle has been present for a much longer time. It was also evident that much of the devastation supposed to have been caused by forest fires was caused primarily by insects.

Many hundreds of trees were examined during the investigation, including those that were living and perfectly healthy, living and

freshly attacked, infested and dying, recently dead, and old dead ones which bore evidence of having been killed by the pine-destroying beetle. All stages of the insect, including the



Courtesy Div. of Entomology.

FRESHLY ATTACKED TREE, SHOWING PITCH TUBES. ADJOINING TREE NOT ATTACKED.

adult, the egg, different stages of the larva, the pupa, and recently transformed beetles, were observed and studied.

The first indication of attack is the red dust or borings lodged in the loose bark and fallen

the entrance burrows (see accompanying illustrations). In this bulletin Dr. Hopkins also suggests methods for preventing losses from the attacks of the pine-bark beetle.



Courtesy Div. of Entomology.

MARKS ON SURFACE OF WOOD WHEN THE BARK IS REMOVED.

around the base of the tree. The next and more conspicuous evidence is the presence of numerous small masses of pitch or so-called pitch tubes on the outer bark at the mouth of

Irrigation Farming. A handbook for the practical application of water in the production of crops. New edition, revised, enlarged, and rewritten. By LUCIUS M. WILCOX. Illustrated. Pp. 500, cloth. Orange Judd Company, New York. Price, postpaid, \$2.

Since the publication of the first edition of "Irrigation Farming" so many important improvements in irrigation have been made and new and better methods been introduced that in order to keep abreast with the times a new edition of this work has been issued. Realizing this need, the author has prepared this volume, which has been largely rewritten, entirely reset, and considerably enlarged so as to present in systematic sequence and concise form everything pertaining to the most modern irrigation methods.

As the author has devoted much of his life to practical irrigation work, the statements made in this book are based on practical experience.

One strong position taken by the author all through the work is the importance of consistent and scientific cultivation in connection with all irrigation operations. While the first edition was primarily written for our western farmers and farms, this new edition also devotes some attention to irrigation in humid regions. The principal chapters treat very fully of the advantages of irrigation; relations of soils to irrigation; treatment of alkali; water supply; canal construction; reservoirs and ponds; pipes for irrigation purposes; flumes and their structure; duty and measurement of water; methods of applying water; irrigation of field crops, the garden, the orchard, the vineyard, and small fruits; all about alfalfa and windmills and pumps. The volume is appropriately illustrated.

PUBLISHER'S NOTES.

It gives us pleasure to call attention to the Gilman School for Girls, now one of the best known and most successful institutions of its kind in New England. It had its origin in the personal need of the founder's family. It was originally intended to be a neighborhood class; but as the theory became better known pressure to admit pupils was so great that a school proved a necessity, and in response to this demand, in 1886, the Gilman School came into being.

In the limited space at our disposal we can do little more than call attention to the work this school is doing. Mr. Arthur Gilman, its founder, is too well known as an author and educator to need an introduction to readers of this magazine. As the editor of the "Story of the Nations" series, for which he wrote

the volumes on "The Romans" and "The Saracens," we have conclusive proof of his ability as a writer and historian. The splendid success of his school testifies to his work as a leader in the field of education.

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of instructors and historic surroundings, can be highly recommended, and persons in search of a first-class institution will do well to correspond with Mr. Gilman.

A select school that is highly recommended is Miss White's Home School, at Concord, Mass. The number of pupils admitted is limited to twenty, in order that each may receive close individual attention. This school offers unusual opportunities for instruction in English, French, German, Drawing, and Music. Miss White's Home School is open to both girls and boys, the sessions running from October to June. Particulars regarding the work of this school may be had by addressing the principal, Miss Flora J. White.

A school that has come rapidly to the front among the high-grade preparatory schools of the South is the North Carolina Military Academy. Its object is not only to give boys a thorough preparation for the leading colleges and technical schools of the country, but also to furnish a liberal training for those not contemplating a college course.

The North Carolina Military Academy is located in the town of Red Springs, Robeson county, N. C., in a community noted for its healthfulness, social refinement, and literary culture. Red Springs is on the Atlantic and Yadkin division of the Atlantic Coast Line Railroad. The climate of Red Springs and the surrounding country is similar to that of Southern Pines, the well-known health resort.

Capt. Clarence A. Short, B. S., is principal of the North Carolina Military Academy. The school year of 1902-1903 opens on September 3.

The Randolph-Macon System of Colleges and Academies now comprises five members, offering secondary and collegiate instruction to both sexes, but in different institutions. Those for young men and boys are: Randolph-Macon College, at Ashland, Va., chartered in 1830; Randolph-Macon Academy, at Bedford City, Va., established in 1890; Randolph-Macon Academy, at Front Royal, Va., established in 1892. Those for young women and girls are: Randolph-Macon Woman's College, at Lynchburg, Va., established in 1893; and Randolph-Macon Institute, Danville, Va., admitted in 1897.

The Randolph-Macon Academy, whose announcement appears on another page, is situated at Front Royal, Va., at the foot of the Blue Ridge, near the Shenandoah River. It is easy of access and is located in a most healthful region. The academy has chosen for itself the field between preparatory home school and the real college course. It prepares boys for college, under discipline appropriate to their

years. Particulars may be had by addressing the principal, Charles L. Melton, A. M.

The illustrated catalogue describing the Adirondack Summer School is one of the hand-somest that has reached us this season. This unique school is conducted by Mr. J. Liberty Tadd, Director of the Public Industrial Art School of Philadelphia and well known as the author of "New Methods in Education." The Adirondack Summer School, which is now in its sixth session, is situated about two miles from Saranac Lake village and seven miles from Lake Placid, New York, on one of the highest and most picturesque spots of that beautiful region. Mountains surround the camp, which is on an eminence overlooking three valleys. The site contains an ideal combination of mountains, lakes, and forest. Every facility is offered students to gain knowledge and experience in the new methods of education as advocated by Mr. Tadd and now in such demand in all parts of this country and abroad. This school offers students an unusual opportunity for instruction in art, manual training, and nature study while enjoying the summer in a most healthful region. The session lasts from June to September.

We beg to acknowledge receipt of a copy of the recently issued catalogue of Syracuse University. Syracuse University corresponds to the American idea of a group of coordinate colleges in which may be pursued the fundamental courses of liberal arts, law, medicine, and Christian ethics. To these are added a college of fine arts and a college of applied science. That Syracuse University is growing in equipment will be readily appreciated when it is stated that in five years five buildings have been erected at an expenditure of \$750,000. In the thirty-one years since Syracuse was established the attendance has grown from 41 to 1,806. A summer school was held at the university from July 1 to August 9.

The eighteenth session of the Jones Summer School of Mathematics and Languages is now in progress at Ithaca, New York. This school is entirely distinct from the summer session of Cornell University, and the work of the university classes is not duplicated. It is for three classes of pupils, as follows: Candidates for admission to Cornell University who lack some of the entrance requirements; students who, by reason of illness, change of course, or other cause, have deficiencies to make up, and candidates for the university under graduate scholarships who wish to review their studies just before the examinations. The Jones Summer School is under the direction of Prof. George W. Jones, the author of a number of widely used text-books on mathematics.

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